New Cabooses for Delaware & Hudson... Page 28

RAILWAY LOCOMOTIVES AND CARS

A SIMMONS-BOARDMAN **TIME-SAVER** PUBLICATION **NOVEMBER 1959**

Cylinder Head Reconditioning on the Milwaukee... Page 23

COMP
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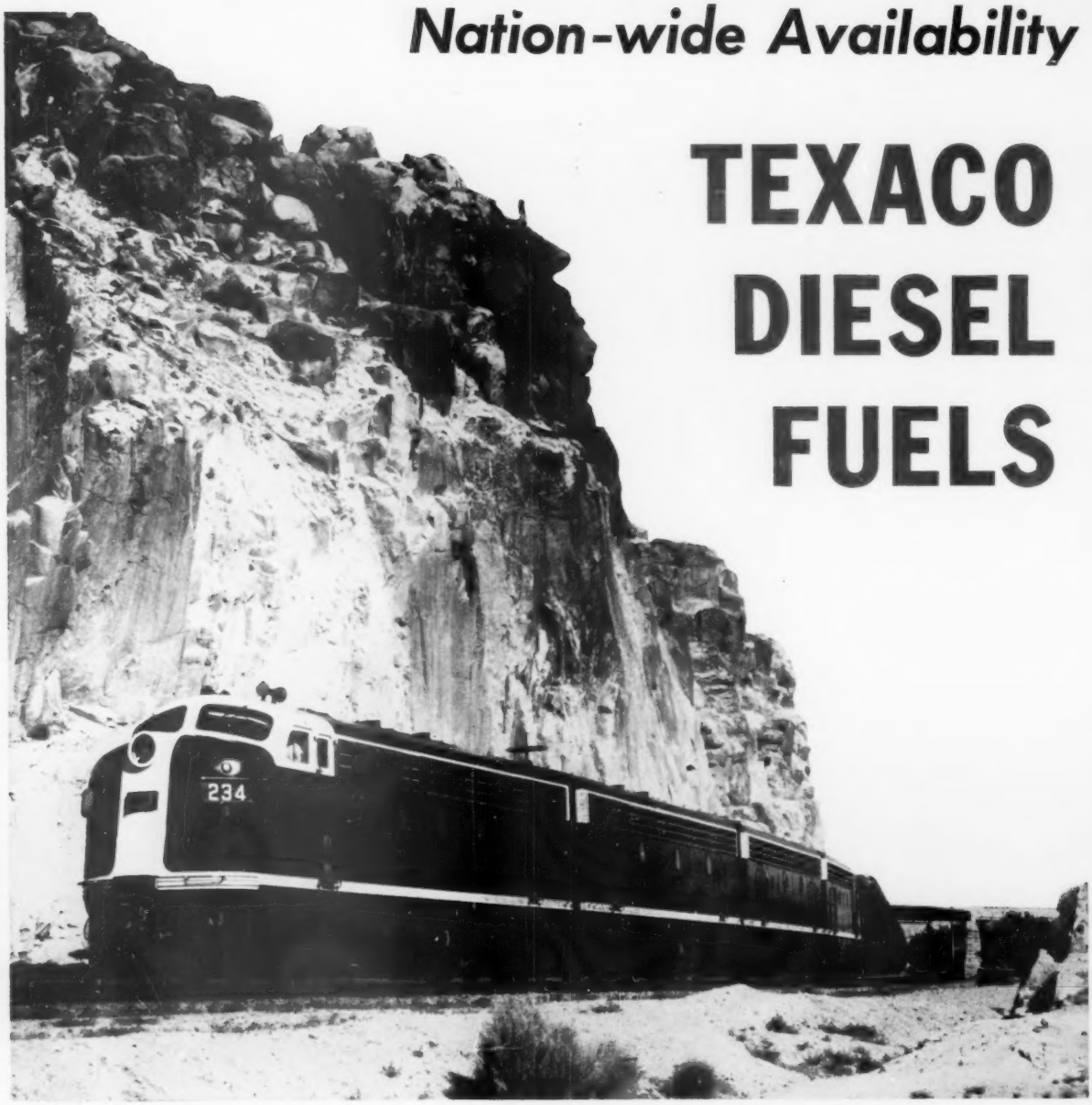

CHECK these two important advantages in using Texaco Diesel Fuels:

FIRST: You can get the Texaco Diesel Fuels you need through any one of more than 100 tank car loading plants strategically located throughout the United States.

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Texaco Systematic Engineering Service—available coast to coast—will gladly help you select the proper fuels, as well as lubricants, for your diesel engines.

Just call the nearest Railway Sales Office in New York, Chicago, San Francisco, St. Paul, St. Louis or Atlanta. Texaco Inc., *Railway Sales Division,* 135 East 42nd Street, New York 17, N. Y.

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RAILROAD LUBRICANTS AND SYSTEMATIC ENGINEERING SERVICE

We look inside your commutator at National

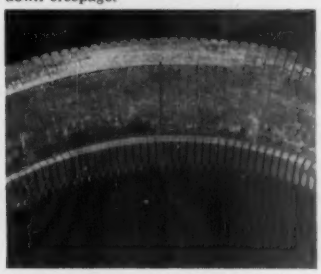
...The Specialists in electric coils/repair service

AND HERE'S WHAT WE OFTEN FIND!

Enlarged view of a dielectric puncture of a mica vee ring at the lower end of the copper bar. This is an example of interior commutator faults which may be present though exterior appears excellent.

Shifted or squirted mica at the apex of the 3° and 30° cone surfaces of a mica vee ring. The black lines on the 3° surface were made by bar-to-bar voltage breakdown creepage.

The bar which projects above those adjacent has been locally overheated under a brush and softened.



A mica segment on the front end of the commutator has started to work out radially and will eventually result in a bar-to-bar short circuit.

When you send D-C machines to National for rewinding or rebuilding, the commutator gets a close inspection and test. But we've found from experience that a commutator that looks excellent on the surface may be in deep trouble inside... with mica cooked, varnish burned, loose copper, or imminent short circuits.

So when we are suspicious of the commutator we remove and open it for a close interior inspection. It's another added assurance that machines rebuilt by National will give you long, dependable service.

For more information, call National's Columbus plant... HUdson 8-1151. Or call the nearest National field engineer.

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ELECTRICAL ENGINEERS • MANUFACTURERS OF ELECTRICAL COILS INSULATION, LIFTING MAGNETS • REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

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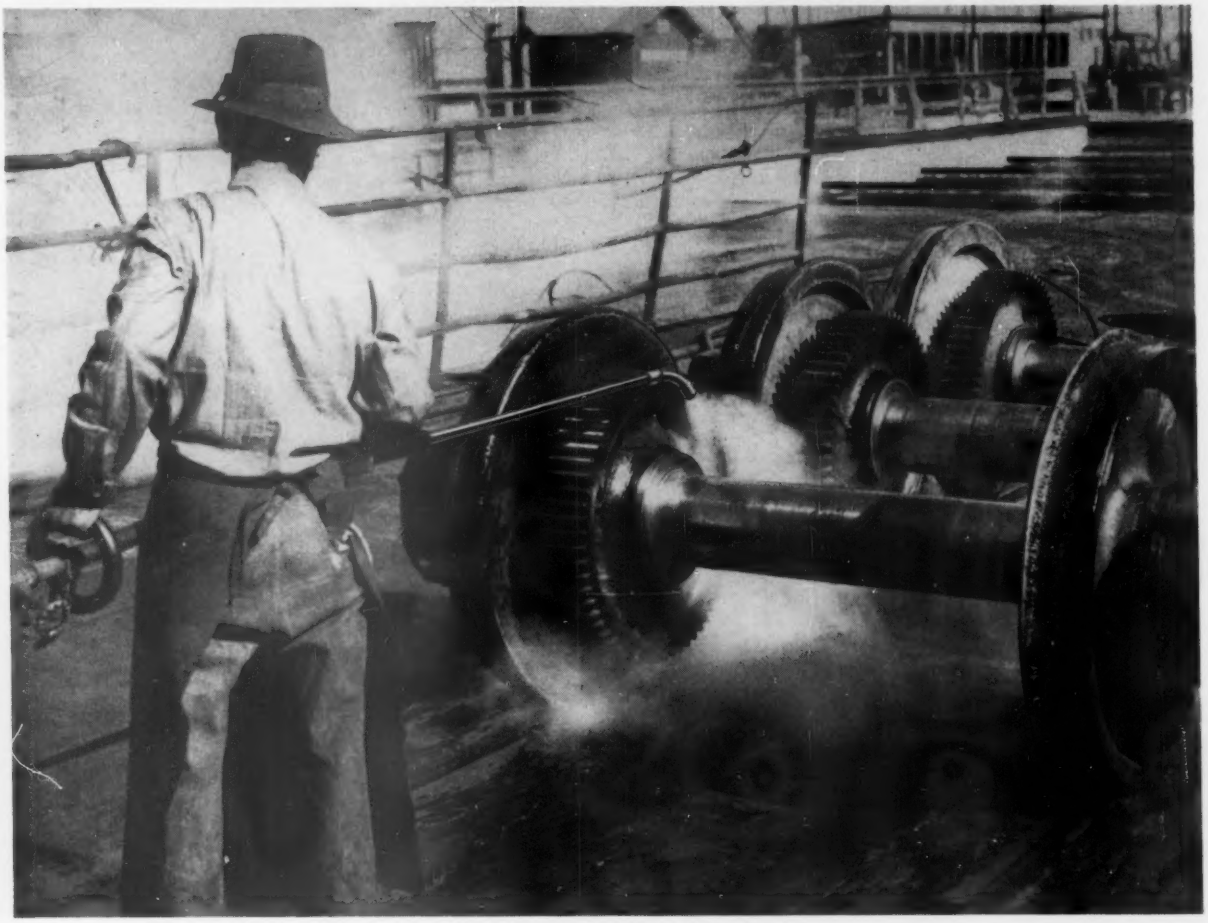

...Hurriclean® Steam-Detergent Gun makes short work of tough cleaning jobs

POWER-UP for the hard jobs of cleaning with the Oakite Hurriclean Steam-Detergent Gun and you'll save money as well as work.

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The Oakite man or Bulletin F-8055 can tell you more. Send for either one. Oakite Products, Inc., 46 Rector Street, New York 6, N. Y.

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RAILWAY
LOCO-MOTIVES AND CARS

The Oldest Trade Paper In the United States

November 1959—Vol. 133, No. 11

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REPORT FOR NOVEMBER

Lubricator Attention When Wheels Are Changed

The AAR Mechanical division has clarified the provisions of par. (h) of Section VI of the AAR Lubrication Manual. Where cars are equipped with journal lubricating devices and until definite rules are provided, the following procedure is suggested if stencilling on the car indicates that journal boxes are in-date:

"Remove lubricators from all journal boxes before wheels are removed from truck (2 boxes for 1 pair of wheels in non-integral trucks and 4 boxes for 1 pair of wheels in integral trucks). Any dirt found in the interior of box is to be removed. Inspect lubricators removed from boxes and renew those found defective. Reapply all lubricators which are in condition for further service. If the devices have any sludge on the exterior, it should be wiped off with a clean cloth."

The AAR feels this procedure will provide adequate lubrication attention without undue cost to the car owner.

Passenger-Car Financing Plan

The Port of New York Authority, under Governor Rockefeller's relief plan to aid New York State commuter railroads, has developed a financing plan that will provide $50,000,000 — $20,000,000 to be loaned directly to the Port Authority by the state; the remainder to be financed by private sources. The total covers the cost of 140 cars tentatively allocated to the Long Island, 130 to the New York Central, and 100 to the New Haven.

Before bids for the new cars can be requested, arrangements for the private financing will have to be completed; long-term lease arrangements will have to be reached with individual roads, the PA and the railroads will have to work jointly on developing specifications for the cars. The latter will aim at standardization as much as possible, considering the different electrical systems on the three roads. Cars will be air-conditioned, electric multiple units.

Preliminary stages, the PA indicated, might be concluded early in 1960 and the first cars rolling by late spring.

Underframes—Topic at ASME Annual Meeting

"Engineering—Pathway to a Better Tomorrow" is the theme for the 1959 meeting of the American Society of Mechanical Engineers to be held at Chalfonte-Haddon Hall, Atlantic City, N. J., November 29 through December 4. Railroad Division sessions are planned as follows.

THURSDAY, DECEMBER 3

9:30 a.m.

Progress in Railway Mechanical Engineering 1958-1959.

Stresses in Wrought-Steel Wheel Rims and Their Relation to Wheel Life—M. S. Riegel, American Iron & Steel Institute.

(Continued on page 7)

TIME SAVING IDEAS FOR NOVEMBER

MOTIVE POWER AND CAR

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3,000 new L&N cars will roll on Southern cast steel wheels

Shown above is one of a record-breaking order for 3,000 Louisville & Nashville cars, rolling out of the Bessemer, Alabama, shops of Pullman-Standard Car Manufacturing Company. All of these modern new hopper cars will be equipped with Southern cast steel wheels.

More and more roads are continuing to specify Southern cast steel wheels for new cars and for maintenance. Southern cast steel wheels are easily bored and mounted. They are precision machined—hubs, bores, flanges, treads—and are delivered in three tape sizes or less.

Southern cast steel wheels can roll up substantial savings for you every mile they travel. American Brake Shoe Company, Railroad Products Division, 530 Fifth Avenue, New York 36, New York.

A-3001

AMERICAN Brake Shoe COMPANY

Quality products cut your ton-mile costs

Precision machined Southern cast steel wheels are inspected with standard steel wheel gauges.

The Application of Diesel Engines to Industrial Diesel-Electric Locomotives—R. W. Barrell, General Electric Co.

2:30 p.m.

Dynamic Stresses in Traction Motors Resulting from Defective Gearing—E. E. Greene, General Electric Co., and M. A. Pinney, engineer tests, Pennsylvania.

Mobile Reflectoscope Inspection of Railway Car Axles under Rolling Equipment on the Chesapeake & Ohio—M. F. Melrose and T. E. De Vilbiss, C&O.

Study of Vibration Frequencies Under Impact Conditions—G. H. Newcomer, director mechanical research, Research Department, AAR.

FRIDAY, DECEMBER 4

9:30 a.m.

Symposium on Cushioned Underframe

Cushioning Requirements for Adequate Lading Protection—W. H. Peterson, Pullman, Inc.

The Hydracushion Underframe and Its Contribution to the Reduction of Lading Damage—S. M. Houston, general superintendent mechanical department, Southern Pacific.

The Santa Fe Shock-Control Car—T. T. Blickle, general manager—mechanical department, Santa Fe.

Impact as Related to Freight Car and Lading Damage—W. E. Baillie, National Malleable & Steel Castings Co.

Increased Cushioning Capacity—A Requirement of Tomorrow's Freight Cars—R. E. Abbott, AAR, and H. K. Lanning, mechanical and research engineer, Santa Fe.

First Aluminum-Steel Covered Hopper Completed

The first of the 100-ton composite aluminum-steel covered hopper cars ordered by the Southern from the Magor Car Corp. (RL&C, August 1959, p 10) has been completed. Magor has bought over 6,500,000 lb of aluminum alloy to build the 455 covered hoppers in the $10 million order. In addition to pioneering the use of aluminum in covered hoppers, these cars will have the highest individual load capacities ever provided in cars of this type.

New Book

ALUMINUM CONSTRUCTION MANUAL. This Manual is primarily a reference work for engineers and designers of aluminum structures. While material on design theory, derivation of formulas, definitions of terms and related subjects is not included, the bases of the allowable-load computations are explained and illustrated by selected examples. Part 1 contains data most frequently needed in designing aluminum structures after forces to be resisted have been determined. Part 2 contains other dimensioning, weight and data useful in preparing estimates and drawings, also load data on beam connections for alloy 6061-T6. Part 3 includes allowable-load data for beams and columns of the same alloy; Part 4, Specifications for Structures of Aluminum Alloys 6061-T6 and 2014-T6, and Part 5, miscellaneous reference data.

The Aluminum Association, 420 Lexington ave., New York 17. Price, $3.

Orders and Inquiries for New Equipment

Placed Since the Closing of the October Issue

Diesel-Electric Locomotive Orders

Road and builder	*No. of Units*	*Horsepower and type*	*Detail*
CANADIAN NATIONAL:			
General Motors Diesel Ltd.	9	1,200 road switch.	For February and March delivery.
UNION PACIFIC:			
General Electric	1	8,000 Road	Four-unit, for freight service; deliverd. Locomotive has been in test service on Erie for several years.

Freight-Car Orders

Road and builder	*No. of cars*	*Type of car*	*Detail*
CANADIAN NATIONAL:			
Marine Industries	100	Flat	50-ton. For December delivery.
GREAT NORTHERN:			
General American	25	Piggyback flat	85-ft, G-85 Type.
MISSOURI PACIFIC:			
American Car & Fdry.	340	Box	Total order of these 1,080 50-ton box cars to cost approx. $9,400,000. Deliveries to start middle of this month and continue at rate of 12 to 20 cars per day until order is completed.
Pullman-Standard	740	Box	
NEW HAVEN:			
Bethlehem Steel	15	Covered gondola	70-ton, 52 ft 6 in., equipped with Standard Railway Equipment Mfg. Co.'s 3-piece removable roofs and Evans DF loaders. Cost, over $200,000.
NORTHERN PACIFIC:			
Pullman-Standard	400	Box	40-ft, with roller bearings and 14-ft door opening (6-ft sliding door and 8-ft plug door). For first quarter 1960 delivery.
	25	Covered hopper	70-ton, 3,219 cu ft cap. Fifteen to have plastic lining and pneumatic unloading devices. For delivery this year.
SANTA FE:			
General American	200	Piggyback flat	85-ft, G-85, with roller bearings. For first quarter 1960 delivery.
Pullman-Standard	155	Covered hopper	70-ton, 3,219 cu ft capacity, with roller bearings and plastic linings. Immediate delivery.
SOO LINE:			
Pullman-Standard	300	Box	These upgraded 40 ft 6-in. PS-1's, originally built in 1956, being leased from United States Railway Leasing Co. of Chicago. Deliveries being made at rate of 8 cars a day.

Passenger-Car Orders

Road and builder	*No. of cars*	*Type of car*	*Detail*
CANADIAN NATIONAL:			
National Steel Car	15	Steam generator	For November-December delivery.
CITY OF PHILADELPHIA:			
Budd Co.	270	Subway	55-ft, stainless-steel. Cost, $24,421,519. 18 months delivery.
MISSOURI PACIFIC:			
Budd Co.	1	Slumbercoach	On lease.
NEW YORK CENTRAL:			
Budd Co.	4	Slumbercoaches	On lease.
NORTHERN PACIFIC:			
Budd Co.	4	Slumbercoaches	On lease.

Notes and Inquiries

Budd Company.—The Slumbercoaches on lease to the New York Central, Missouri Pacific, and Northern Pacific, as noted in the Passenger Car Orders above, are nine of Budd's original production of 18 Slumbercoaches. Five had previously been put in service by the Baltimore & Ohio and four by the Burlington.

Proposed Erie-Lackawanna Shop Locations

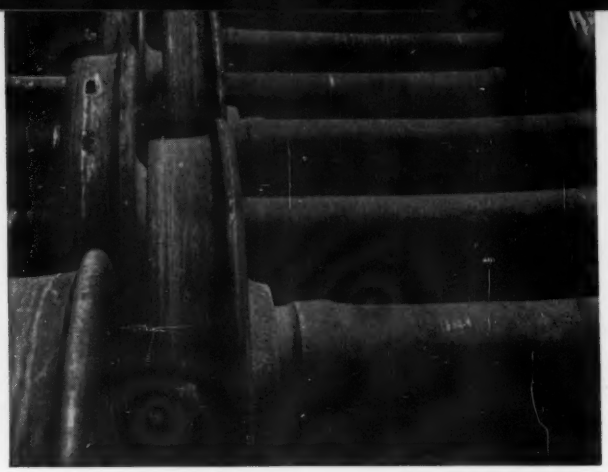
According to the general plan outlined in the October issue of the Erie Railroad Magazine, when the merger of the Delaware, Lackawanna & Western and the Erie is approved by the ICC next year, headquarters of the new Erie-Lackawanna Railroad Company will be located in Cleveland. Mechanical department headquarters will also be in Cleveland. A total of 103.7 miles of railroad, mostly duplicate trackage, will be abandoned—95.3 miles on the Erie and 8.4 miles on the DL&W.

Present DL&W enginehouse and car department facilities at East Binghamton, N. Y., will be used by the combined road. Erie enginehouse facilities at Jersey City and Croxton, N. J., and the Lackawanna enginehouse at Hoboken, N. J., will be retained. The Erie car repair track at Croxton will be expanded to serve the entire terminal.

All heavy freight-car repair work will be done at Erie's Meadville, Pa., shop. Heavy passenger car repair work will be done at Lackawanna's Keyser Valley, Pa., shop; Susquehanna shops to be discontinued.

Heavy repairs to diesel locomotives will be made at Erie's Hornell, N. Y., Jersey City and Marion, Ohio, shops, and Lackawanna's Scranton, Pa., shop.

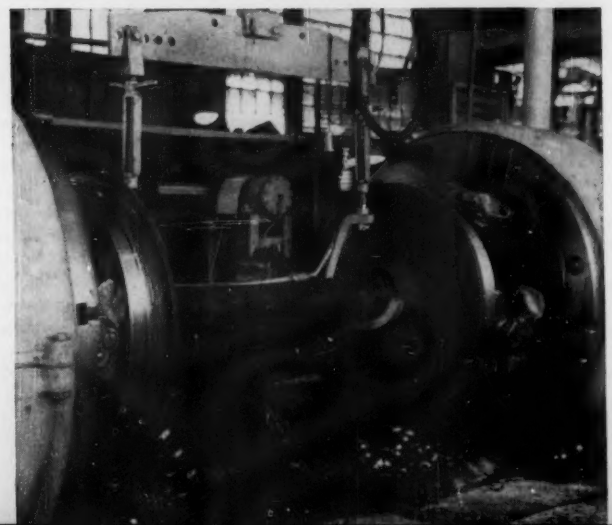
Rolling stock will include about 700 diesel locomotives, 33,000 freight cars, 1,200 passenger cars, and 1,100 company service cars.



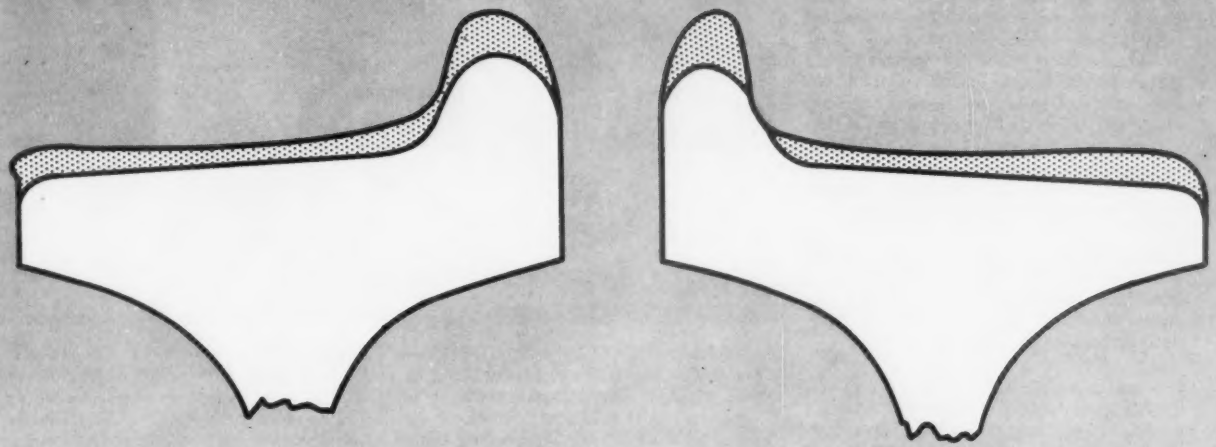
Worn wheels await inspection at B&O Glenwood Shops, Pittsburgh, Pa. New flange and tread contours will be turned on all wheels meeting AAR minimum requirements for interchange service.

Turning new contours instead of scrapping often saves 75 to 90 pct of cost of new wheel

Gaging flange thickness of worn wheel. This wheel (shown at upper right, opposite page) has thin flange condition which can be remedied by turning.



Wheel set mounted in automatic lathe which turns new contours simultaneously on both wheels to assure a mated pair. Rough- and finish-turning take just over an hour.



Actual contour sketches of mated pair of Bethlehem one-wear, wrought-steel wheels at Glenwood Shops of B&O. Shaded area represents metal turned off the wheels to correct thin flange condition in wheel at upper right. (Inset) Gage shows new contour correct for both flange and tread.

How the B&O cuts costs with Bethlehem one-wear wheels

When worn wheels roll into the Baltimore & Ohio Railroad's Glenwood Shops, Pittsburgh, Pa., they are not automatically condemned to the scrap pile.

Far from it . . . *particularly if they are wrought-steel wheels!* B&O engineers have found that these wheels—including Bethlehem one-wear wheels—can be given a whole new lease on life by the simple process of turning new flange and tread contours in a wheel lathe in full accord with AAR Interchange Rules.

Wheel Salvage Pays Off

B&O studies show that the direct cost of machining worn wheels is about the same as that of stripping off the old and mounting brand-new wheels. So the difference between the price of new wheels and the scrap value of the old represents pure savings . . . savings of 75 to 90 pct of the cost of a new wheel. What's more, these turned wheels may, depending upon service conditions, deliver as many additional miles of service as they did before turning!

A Word of Caution

Interchange Rules do not permit the turning of all types of wheels. To be on the safe side—the true economy side—standardize on Bethlehem one-wear, wrought-steel wheels. Bethlehem wheels generally have more than enough metal in the rim to permit turning. They are a known value, combining true economy with highest quality. You can buy them with complete assurance of dependable performance.

BETHLEHEM STEEL COMPANY, Bethlehem, Pa. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Personal Mention

Canadian National.—*Moncton, N.B.:* ROBERT J. JESSIMAN appointed mechanical car inspector, Atlantic region. *Stratford, Ont.:* W. G. NOTLEY appointed superintendent motive power shops. *Toronto, Ont.:* F. W. BROUGHTON, assistant mechanical engineer, appointed mechanical engineer, succeeding Mr. Notley. *Winnipeg, Man.:* G. A. HOWARD appointed regional co-ordinator of work study, Western region. Formerly superintendent of shop methods at Montreal.

Canadian Pacific.—*Smith's Falls, Ont.:* E. B. WHEELER appointed master mechanic. *Toronto:* RAYMOND CHRISTIE appointed division master mechanic Toronto Terminals Division, succeeding Mr. Wheeler.

Chesapeake & Ohio.—*Richmond, Va.:* T. G. SPATIG, special engineer, appointed assistant mechanical engineer. Former position abolished. R. P. BALLENGEE appointed general foreman, car department.

New York Central.—*New York:* J. H. HERON appointed to new position of assistant vice-president-equipment, succeeding S. T. KUHN, who will retire January 1. F. A. DANAHY appointed general supervisor diesel locomotive maintenance. R. J. MURPHY and G. MCGONEGA appointed assistant and general supervisors diesel locomotive maintenance. *Weehawken, N. J.:* JOHN F. MIZZI appointed general car foreman. Formerly assistant general inspector at New York. *Chicago:* CECIL DRISKILL, gang foreman, appointed division supervisor air brakes and steam heat.

J. H. HERON, newly appointed assistant vice-president—equipment, previously chief mechanical officer of Great Northern at St. Paul. Entered service of GN in 1936, serving successively as draftsman, fuel supervisor, shop superintendent, assistant to general superintendent motive power, superintendent motive power, and chief mechanical officer. New appointment became effective November 1.

Northern Pacific.—*Livingston, Mont.:* A. R. GENIN appointed shop superintendent, succeeding A. I. ANDERSON, retired. Mr. Genin formerly general foreman.

Pennsylvania.—*Philadelphia:* H. L. WOOD appointed assistant manager of methods and cost control. *Long Island City, N.Y.:* JOHN M. CARPENTER appointed master mechanic, Sunnyside Yard, in charge of passenger locomotive and car maintenance. Mr. Carpenter, who succeeds Mr. Wood, was formerly master mechanic at Indianapolis.

Southern.—*Knoxville, Tenn.:* DAVID W. PIPPINGER, general foreman, appointed assistant manager, Coster shop. *Birmingham, Ala.:* R. W. RUSSELL appointed road foreman of engines. Formerly road foreman of engines at Meridian, Miss.

OBITUARY

E. B. Fields, mechanical assistant, Santa Fe, died October 2 in Hindsdale Sanatarium, Hinsdale, Ill.

J. H. Heron
NYC

C. E. Grigsby
ASF

W. M. Cree
Edgewater Steel

Supply Trade Notes

AMERICAN STEEL FOUNDRIES.—*Chester E. Grigsby,* vice-president and director of ASF and general manager of Transportation Equipment Division, appointed head of division, succeeding *Charles L. Heater,* retired.

■

EDGEWATER STEEL CO.—*Walter M. Cree,* general sales manager, elected vice-president of sales.

■

SPARTON CORP.—*Kenneth E. Martin* appointed western regional sales manager, Railway Equipment Division.

■

OAKITE PRODUCTS, INC.—*T. A. Ted Rohlfsen* appointed manager, South Pacific Coast Division, succeeding *J. C. Leonard,* retired.

■

ELECTRIC AUTOLITE CO.—Electric Autolite has purchased the assets of *C&D Batteries, Inc.,* which will become the C & D Batteries Division of Autolite. *John F. Rittenhouse,* president, and *Henry E. Jensen,* vice-president of C & D, have been elected vice-presidents of Autolite. Mr. Rittenhouse will be general manager, and Mr. Jensen head of engineering marketing of the new division.

■

STRAN-STEEL CORP.—*M. M. Anderson,* chief engineer, appointed vice president—engineering at Terre Haute, Ind.

■

NALCO CHEMICAL CO.—*Dr. David G. Braithwaite* appointed to newly created position of executive vice-president in charge of manufacturing, research and development.

■

WINE RAILWAY APPLIANCE CO.—UNITCAST CORP.—*Lambert J. Tillman,* board chairman, who retired from active service July 1, re-elected board chairman. *Cyrus Hankins,* vice-chairman, retired.

■

WINE RAILWAY APPLIANCE CO., DIVISION OF UNITCAST CORP.—*Ralph H. Aul* appointed sales engineer, Eastern territory. Mr. Aul formerly associated with American Car & Foundry Division, ACF Industries, Inc.

■

CHICAGO RAILWAY EQUIPMENT CO.—*W. E. Mattern, Jr.,* appointed eastern sales representative, succeeding *Roland S Folk,* retired.

FAIRBANKS, MORSE & CO.—*Gordon R. Anderson,* vice-president, engineering, at Chicago, appointed vice-president and general manager of Beloit (Wis.) Division, with responsibility for production and sales of diesel engines, locomotives, compressors, magnetos and rewind starters. New general managers are: *Paul Flood,* Large Machinery Division; *H. E. Hanson,* Diesel Compressor and Locomotive Division; *Clay Armstrong,* Magneto and Engine Accessory Division.

■

INDUSTRIAL BROWNHOIST CORP.—*Warwick J. Hayes, Jr.,* vice-president of sales and advertising, elected executive vice-president and general manager.

■

COLORADO FUEL & IRON CORP.—*George C. Jennings* appointed wire rope sales manager at Palmer, Mass., succeeding *A. S. Rairden,* now works manager at Palmer. Mr. Jennings formerly New York district sales manager.

■

ALCO PRODUCTS, INC.—*Hans Schwarz* appointed manager of general engineering and development in the research and development department at Schenectady, N. Y. Mr. Schwarz formerly a senior project engineer.

■

MINNESOTA MINING & MANUFACTURING CO.—*Paul D. Howard,* railroad trades sales supervisor, appointed railroad trades market manager, reflective products division, St. Paul, Minn.

■

SHERWIN-WILLIAMS CO.—*E. Colin Baldwin* appointed vice-president and general manager, with headquarters in Cleveland.

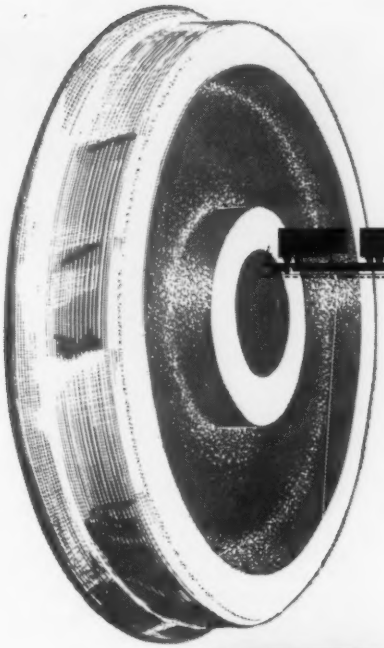
■

BRENCO, INC.—*M. B. McCracken* of Mells Cargo Supply, 115 New Montgomery st., San Francisco 5, Cal., appointed exclusive West Coast agent for Brenco journal bearing products.

Obituary

VOLNEY B. FOWLER, 62, director of public relations, Electro-Motive Division, General Motors, died Tuesday, October 6, in Presbyterian-St. Luke's Hospital, Chicago.

TRAILER TRAIN SPECIFIES WROUGHT STEEL WHEELS FOR HIGH-MILEAGE SERVICE



New steels are born at Armco

"Our piggyback cars average from 75,000 to 100,000 miles per year; some assigned cars up to 200,000 miles per year." says J. H. Long, Chief Mechanical Officer of Trailer Train Company, Haverford, Pennsylvania. In addition, heavy braking is required in extensive mountain travel.

"These are two of the reasons why we have standardized on wrought steel wheels for these cars.

"Although many of our cars have traveled in the neighborhood of 350,000 miles, comparatively few multiple-wear wrought steel wheels have been turned to date."

Forging and rolling make the difference

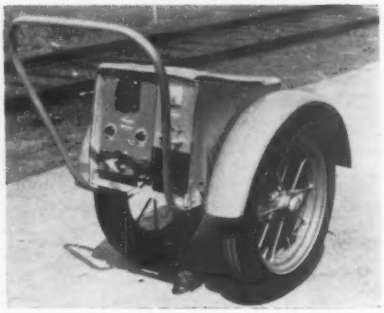
After more miles, there's more metal left on wrought steel wheels. Forging and rolling refine the structure of the steel—give it greater resistance to wear, shock and pounding. That's why you get more service miles per dollar, greater safety, with Armco Wrought Steel Wheels.

For price and delivery information, just call your Armco Sales Office or write Armco Steel Corporation, 3329 Curtis Street, Middletown, Ohio.

This is typical of the high-mileage Trailer Train piggyback cars, many of which have Armco Wrought Steel Wheels. All cars are 70-ton capacity, and range in length from 75 to 85 feet.

ARMCO STEEL

Armco Division • Sheffield Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation

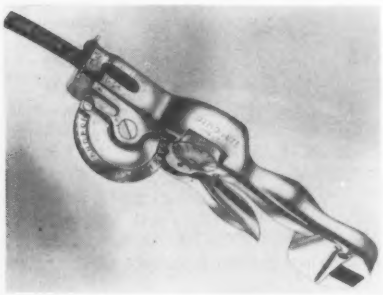


Mobile Flaw Detector

Semi-automatic flaw detection of car axles is now possible with the mobile flaw detector which can be operated by one man with minimal experience. The unit detects fatigue cracks in the most critical area of axles. It eliminates the need for an external power source. A transistorized inverter furnishes the necessary voltage to the modified Reflectoscope from a 12-volt battery operated source. This type U.S. single frequency Reflectoscope includes a transistorized monitor to provide "go-no-go" gate operation through gating and discriminator level circuitry.

The monitor includes aural and visual alarms. Because of battery operation, the unit may be used for other testing in remote areas where power is not readily available.

The search probe uses six crystals with the angle-beam technique which bounces the sound off the sides of the axle from surface to surface in a predetermined pattern. The probe is self compensating for various axle sizes. A red light in the search probe handle signals when a defect is located. *Sperry Products, Inc., Dept. RLC, Danbury, Conn.*

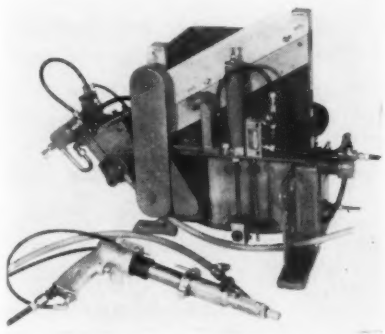


Hand Embossing Machine

The Dymo labeler permits making permanent embossed labels on-the-spot on plastic and metal tapes, with or without adhesive backs. A built-in cut-off blade cuts finished label to desired length. The tapes cannot be altered or easily marred, and are sun and weather resistant. *Dymo Corp., Dept. RLC, 2546 10th st., Berkeley 10, Calif.*

Neoprene Protective Coating

Coro-Gard 1706 protective coating has high adhesion to unprimed steel, aluminum, copper, wood and glass fiber reinforced polyester plastics, etc. It air-cures to a tough rubbery protective film, and is said to have outstanding resistance to a 20 per cent concentration of hydrochloric and sulfuric acids, distilled and salt water, and alkalies at continuous service temperatures up to 120 deg. F. The coating can be applied by brush without diluting or stirring and will not sag or flow when applied to vertical surfaces. *Adhesives, Coatings and Sealers Div., Minnesota Mining & Manufacturing Co., Dept. RLC, 900 Bush ave., St. Paul 6, Minn.*

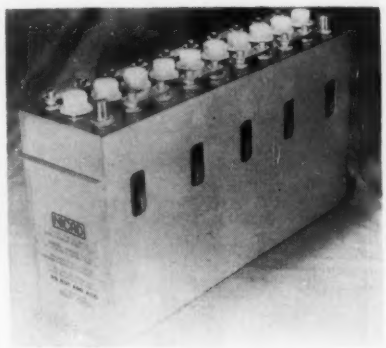


Automatic Screwdriver

The Model B Powasert automatic screwdriver will handle all wood screws from ½ to 1-¾ in. in gages 6-10. Round, flat, and oval-headed screws; some pan, truss and binding type heads can be driven with the unit. Slotted or cross-recessed drives can also be handled. Twenty-six different sizes and types of screws can be fed and driven without any change of fittings at speeds up to 60 per min. The gun can be handled with either hand. The feeder-separator unit holds 10 lb of screws for up to 8 hr of continuous operation. *United Shoe Machinery Corp., Dept. RLC, Boston 7, Mass.*

Lubricating Compound

Sil-Glyde, a lubricating compound with silicone, is for use on rubber, metal, wood, and plastics. It is said to prevent freezing and sticking; eliminate squeaks; make sliding locomotive windows and car doors work easier; winterize weather stripping; weatherproof ignition systems, and lubricate V-belts. It has a film strength effective from 400 deg down to —20 deg F. It is recommended for refrigeration car gaskets. *American Grease Stick Co., Dept. RLC, Muskegon, Mich.*

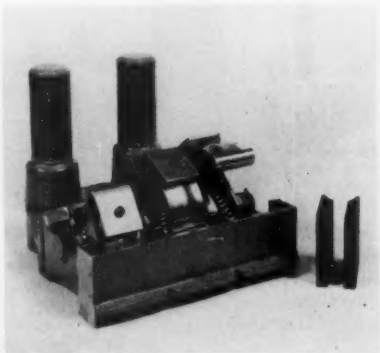


Refrigerator Car Battery

This 12-volt, 62-amp hr nickel cadmium alkaline battery for diesel engine starting in mechanical refrigerator cars is said to have exceptionally low internal resistance and to require only infrequent attention. It is capable of delivering heavy starting currents in temperatures between minus 40 deg F and plus 165 deg F. *Nicad Div., Gould-National Batteries, Inc., Dept. RLC, Easthampton, Mass.*

Moisture Inhibitor

Through the use of CRC moisture inhibitor, electrical characteristics which deteriorate in moist and humid atmospheres are said to be fully restored in electrical equipment, even in that which has been totally submerged. It is a non-toxic, non-conducting chemical liquid which also facilitates cleaning rust, scale and dirt. *Corrosion Reaction Consultants, Inc., Dept. RLC, 116 Chestnut st., Philadelphia 6.*



Traction Motor Brushholder

The Ringsdorff shuntless brushholder features a rubber cushioned pressure finger and the application of brushes with a round

(Continued on page 14)

AVAILABLE IN ¾" AND 1¼" CAPACITIES. Shown at right is Model 18-B-7 with ¾" rated capacity. Write for Bulletin 18-11.

NEW

GARDNER-DENVER IMPACT WRENCHES

Model 18-B-9 impact wrench with 1¼" rated capacity. Write for Bulletin 18-15.

hit harder...last longer

Here are two new lightweight, easy-to-use impact wrenches that hit harder—yet don't wear themselves out. They're the result of intensive Gardner-Denver engineering to develop a powerful, long-lasting impact mechanism. The combination of a fast-accelerating air motor and a new, patented clutch mechanism assures positive starts, efficient impacting and lowest maintenance.

And look at these big advantages: light weight—lowest weight possible consistent with high-power output . . . easily disassembled for service . . . no torque reaction . . . reversing lever protected from accidental engagement but readily accessible when needed.

For *your* production or maintenance jobs, get the complete story on the new Gardner-Denver impact wrenches. Contact your nearby Gardner-Denver air tool specialist or write for bulletins.

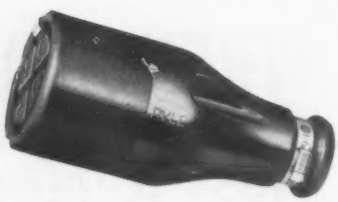
EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

groove in the brush head. Based on initial tests, the brushholder is said to have increased brush life on most applications from 10 to 200 per cent over what was originally experienced. The cushion between the pressure finger and the lever arm dampens the energy of motion of the brush converting it into internal friction of the cushion material. It also relieves the shaft of the pressure finger and spring suspension from wear. According to the manufacturer, live rubber in the tension fingers removes 95 per cent of brush vibration. The brushholder design allows for an almost constant 6 lb pressure during brush life. In changing brushes, it is only necessary to push the finger back where it will remain until brought forward.

With the use of shuntless split brushes, the halves of the brush are concaved to provide a space for a round contact roll. This groove keeps the finger pressure in a vertical line. A positive contact for the brushes is provided by a silver inlay on the contact roll. The brushholder is made with three individually attached brushholder boxes so that any box can be removed and replaced without scrapping the entire brushholder. *Pittsburgh Carbon Div., Ringsdorff Carbon Corp., Dept. RLC, P. O. Box 22, East McKeesport, Pa.*

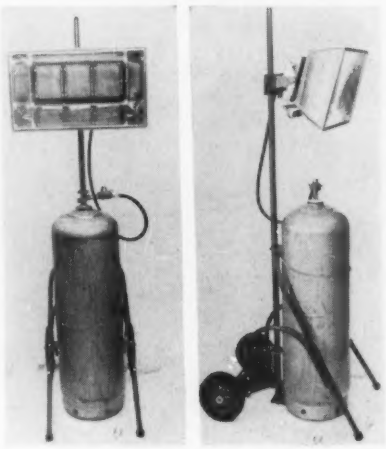


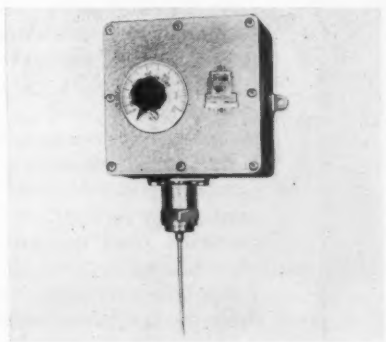
Waterproof Standby Plugs

A waterproof standby plug facilitates continued air conditioning and refrigeration while passenger cars are standing in yards and depots. The plug, which makes use of wayside power, meets the recently adopted specifications of the AAR. It has pressure type (solderless) contact terminals and can be attached to the cables in the field. Wiring space is completely sealed and, it is said, the plug would be usable even after lying in water. Contacts are removable and easily replaced. *Pyle-National Co., Dept. RLC, 1334 N Kostner ave., Chicago 51.*

Infra-Red Heaters

The infra-red rays of these portable gas-fired infra-red radiant heaters can be concentrated on specific areas by polished parabolic reflectors without heating the surrounding air. Workmen, tools and material are said to remain comfortably warm even when the temperature falls to zero or below. The heaters operate outdoors or in on bottled propane gas. They are available in three sizes. A portable Handi-Heater, weighing only 8 lb, has a rated input of 16,000 Btu and will operate 26 hr on a 20-lb LP gas cylinder; 6½ hr on a 5-lb cylinder. Two larger sizes are mounted on a verticle support rod attached to a wheeled propane bottle carrier. Seven adjustment positions are provided from 3½ to 7 ft high. The larger model is rated at 36,000 Btu and operates 60 hr on 100 lb of propane. The smaller unit has a rated input of 24,000 Btu and operates 90 hr on 100 lb of propane. *Perfection Industries, Division of Hupp Corp., Dept. RLC, 1135 Ivanhoe Road, Cleveland 10.*

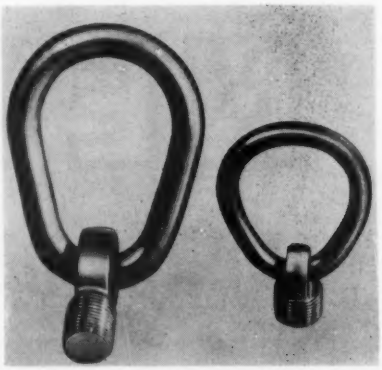




Non-indicating Temperature Control

The Model GWS control is a single-point, weather resistant non-indicating temperature control, designed primarily for exterior use to control refrigeration or heating equipment. It is suited for cargo containers, highway transport, or railroad applications. It is resistant to weather and vibration and shock and operates with equal efficiency either for heating or refrigeration by reversing the position of the switches with the case. With a manual reset limit switch, heating or cooling medium can be shut off at any predetermined temperature. This switch is used in conjunction with a temperature control as a safeguard against results of control or accessory failure (solenoids, motor valves, etc.). Used as a limit control, it is set a few degrees higher (or cooler) than the separate controlling instrument. If the control fails to shut off, the limit control will operate to stop the flow of the heating or cooling medium.

The GWS control can be had with either of two sentivities: (1) normal—1 per cent of scale range, and (2) close—½ per cent of scale range. *Partlow Corp., Dept. RLC, 530 Campion Road, New Hartford (Utica), N. Y.*



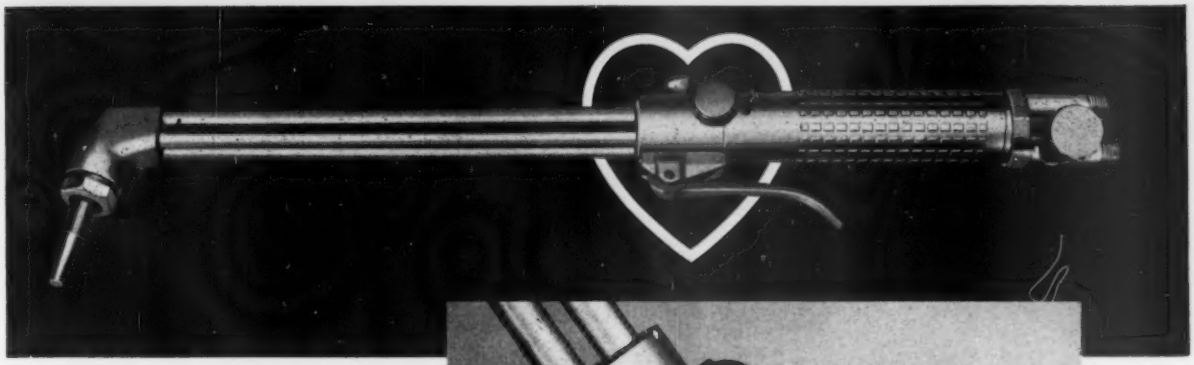
Tie-Down Rings

Tie-down rings and floor fittings for fastening needs on trucks and flat cars are available in sizes from 2,000 to 50,000 lb capacity. They can be used with all types of cargo tie-down materials, such as nylon and canvas webbing, and wire rope and rope slings. Rings are made of 4130 heat-treated alloy steel, cadmium plated and magnetically inspected to government specifications. Threaded studs permit fast installation and flush wall and floor surfaces. *Mak Industries, Inc., Dept. RLC, 1938 Park ave., New York 37.*

Hopper-Car Coating

Thiopox is a coating developed by the Thiokol Chemical Co. from a polysulfide liquid polymer and epoxy resin supplied by the Phelan Faust Paint Manufacturing Co. It is said to provide not only protection against corrosion in fertilizer and chemical carrying hopper cars, but also to

(Continued on page 60)



This New Airco 9500 Torch was designed with the operator in mind. Its smooth-working "E-ZE-OX" cutting oxygen valve, its fine balance and heft, its preheat valves located on same side of torch, its rugged triangular tube arrangement, its "corncobbed" knurled handle for nonslip grip — all make the 9500 a favorite with experienced welding men. Sizes 13" to 72".

the Heart of the **NEW AIRCO 9500 TORCH**

is the exclusive **NEW "E-ZE-OX" VALVE** for Cutting Oxygen

When an operator starts a cut with the Airco 9500 Torch, the new "E-ZE-OX" valve lets him open the cutting oxygen valve smoothly — and effortlessly — so there is no splash of molten metal. Nor will the torch kick up to mar the plate outside of the work area. This is particularly important in piercing starts. Heads available in three angles: 45°, 75° and 90°. Look in the Yellow Pages of your phone book under "Welding Equipment and Supplies" for the Airco Office or Authorized Airco Dealer nearest you.

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For Railroad Insulation Requirements . . .

the big news for 1959 is

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With L·O·F Glass Fibers Company joining the Johns-Manville family, your J-M representative can now supply Transulite® fiber glass insulation blanket—developed specifically to meet the requirements of the transportation industry—also a wide range of other fiber glass materials.

For refrigerator car use—J-M Transulite fiber glass blanket has a special binder which minimizes moisture pick-up even under the most severe operating conditions. Extremely fine fibers are bonded together with thermo-setting resin into an unusually resilient blanket with these main advantages:

- **Superior thermal performance**
- **Excellent resistance to moisture pick-up from humid atmosphere**
- **Meets flame spread specifications**
- **Light weight and ease of handling**
- **Resists settling or sagging caused by vibration**

Other J-M Fiber Glass insulations, Microlite® and Microtex®, serve in many railroad applications.

In railroads, as in many other industries, buyers of fiber glass products will now be served by an enlarged staff of J-M sales and technical personnel operating out of 56 sales offices . . . by expanded distribution facilities . . . by the addition of 7 strategically located plants and by expanded research and product development of fiber glass products.

Call your Johns-Manville representative or write to Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

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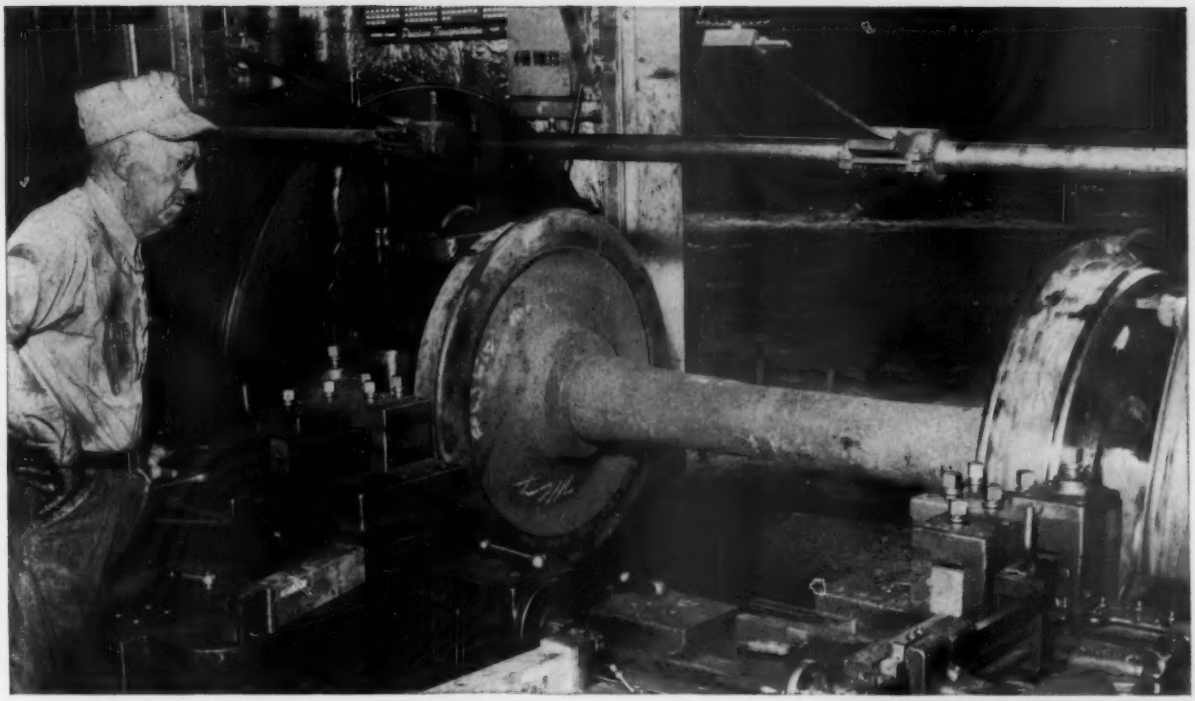
JOHNS-MANVILLE JM PRODUCTS



Photographs courtesy of Norfolk and Western Railway Company, Roanoke, Virginia

Tool-cost-per-wheel cut 77% by switching to new Kendex* tooling

All other factors in this tread contouring setup remained the same . . . same lathe, same operator, even the same grade carbide (Kennametal K21) was used for all cutting edges. The only change was to switch from Kennametal "H" type tooling with regrindable inserts to new Kendex tooling with turnover, "throw-away" type inserts. The result . . . tool-cost-per-wheel dropped 77%. The table gives the operational data in detail.

A solid Kennametal shim provides a solid seat for the insert and permits harder, more wear-resistant grades of Kennametal to be used when required. Chipbreakers of Kennametal provide better chip control and eliminate chipbreaker grinding.

Find out how these new tools can save *you* money . . . *on either Niles or Sellers lathes.* Contact your Kennametal Representative or write for new Catalog RR259. KENNAMETAL INC., Latrobe, Pennsylvania. 87222

*Trademark

OPERATIONAL DATA: Niles car wheel lathe, turning 33", 36" and 40" diameter wheels at 14 to 16 RPM, 1/16" to 3/32" feed, and 5/8" maximum depth of cut.

	Kennametal "H" type tooling with Kennametal K21 inserts	New Kendex tooling with Kennametal K21 inserts
Insert cost	$15.13	$4.03
Insert regrinding cost	9.00 (10 regrinds)	NO regrinding*
Total insert cost	$24.13	$4.03
Wheels per cutting edge	6	6
Cutting edges per insert	11 (orig. edge + 10 regrinds)	8*
Wheels per insert	66	48
Insert cost per wheel	$24.13 ÷ 66 = .366	$4.03 ÷ 48 = .084

*Kendex tooling eliminates all regrinding. When one edge becomes dull, the insert clamp is released, the insert turned to a new edge and reclamped without disturbing the tool . . . no need to reset or gage the tool. When all eight edges of the insert have been used it is replaced.

INDUSTRY AND KENNAMETAL
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EDITORIALS

Diesel Horsepower

With steam power totalling less than one thousand locomotives, and less than half of these in service, the interest now is not in the replacement of steam by diesels. It is in the future development of diesel-electric power. Builders have developed and placed in service diesels with up to 2,400 hp in a single unit equipped with one turbocharged engine. Is this the limit of horsepower per unit or will 3,000 or more horsepower in a single cab be the next step?

More horsepower per unit gives a railroad the advantage either of using fewer units to haul the same tonnage or handling more tonnage with the same number of units. Logically, if technological advances permit, the ultimate objective would be to use one unit of eight or ten thousand horsepower.

This trend toward more horsepower per unit poses many probelms to those responsible for motive power maintenance. It would be very helpful to those planning for facilities to maintain and service locomotives if they knew what to expect in motive power development during the next several years. It is probable that much more horsepower per unit than now available will be produced. How much more is a question the locomotive builders should answer.

Selling an Increased Investment

Constant stress on reliability and greater speed in freight train operations is putting car departments under steadily growing pressures. Great emphasis has been placed on the acquisition of the best motive power, traffic control, and train communication equipment to speed freight trains. In every case, the equipment also has served to reduce manpower requirements.

When it comes to the freight cars to be moved with this elaborate and expensive equipment, we frequently find another situation. There often have been the manpower reductions prior to the introduction of the latest technological developments. W. M. Keller, AAR vice president—research, told the recent Car Department Officers meeting that "railroads cannot live with the waste-pack box." He went on to say that in today's railroad picture, there is neither the manpower nor the time to make possible successful operation of journal boxes with the traditional lubricating medium. The current journal lubricator program is one step toward a solution of this problem. It requires an increased investment in each individual car, even though the expenditure for such an improvement is not large.

While it has been possible to sell optimum investment in motive power, frequently cars are bought at the lowest possible unit price. This can, of necessity, mean equipping them with components which ultimately increase their servicing and maintenance costs. It can also make them incompatible with the type of operations which railroads now see as necessary for survival. One evidence of this is that a growing proportion of all train delays are due to the cars in them.

Mechanical officers will have to do a better job of selling the best possible overall designs and components for future freight cars. Increased investment in each individual freight car is inevitable if cars are to be thoroughly compatible with the railroad transportation system we are developing. Justifying increased investment is probably more complicated in this field than in any other. Utilization of freight cars can never be too good despite the availability which might be achieved with increased investment. In the face of limited capital available to railroads, the prospects of low utilization make increased freight car investments hard to sell. But they will have to be sold if tomorrow's freight cars are to operate in the services which are being planned.

Write It Down

Hundreds of railroad men in the mechanical department have worthwhile ideas and information. Most of these men can do a reasonably good job of translating these ideas and facts into words. But we in the publishing business know by experience that all too few spend the time or effort to do so. We know, too, that worthwhile ideas and information are worthless unless they are made available to those responsible for appraising their worth and making decisions on how to use them.

The value of "writing it down" was stressed by E. K. Bloss, director research and development, Boston & Maine, at the recent Locomotive Maintenance Officers' Association annual meeting. He urged all in attendence to become reporters. Why? To keep "the bosses informed of what is wrong with today that they have got to improve tomorrow. We have got to be better to stay in business. If there is something you do not like, if you have an idea you can do something better—write it down, then rewrite it."

Mr. Bloss said "writing it down, and rewriting it" does two things. It gives a person an opportunity of studying the idea and correcting any errors which might result in the boss saying "What a crazy idea." Rewriting it avoids not having anywhere from 10 to 50 per cent of the facts. And problems can not be solved without all the facts.

This job of "writing it down" has never been popular with railroad men. But the railroads are so important that nothing affecting their survival should be prosecuted in a haphazard manner. "Writing it down," however unpopular, will help the railroads do that better job tomorrow that is so essential if they are to stay in business.

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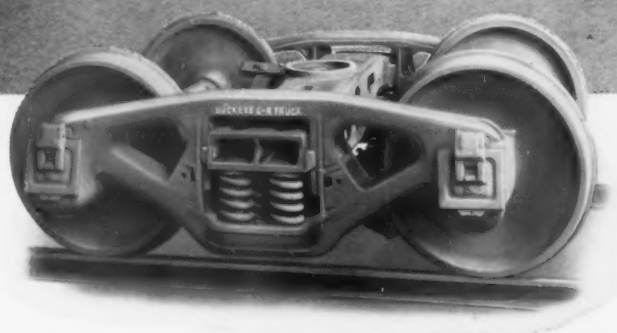

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A Factual Report on COBRA* SHOES

based on a personal interview with Mr. Walter Kresge, General Superintendent, Pittsburgh & West Virginia Railroad Company

What does railroad management think of COBRA SHOES after some four years and 200,000,000 (200 million!) vehicle miles of service? That's the question . . . and while we folks who make COBRA SHOES, and have been continuously testing them under almost every conceivable condition of service, might think we know the answers, we learn something new almost every installation about these truly revolutionary brake shoes. But, to let you hear direct from a man who is in a position to observe the actual in-service performance of COBRA SHOES, we sent R. A. Mitchell, our representative, out to the Rook Yards of the Pittsburgh & West Virginia Railroad Company (near Pittsburgh) to interview Mr. Walter Kresge, General Superintendent. Mr. Kresge is the superintendent of both the Operations and Mechanical departments.

Mr. Mitchell: We understand that your yard locomotives are all equipped with COBRA SHOES.

Supt. Kresge: Yes. But our yard locomotives are *also* our road locomotives, so the fact is, all locomotives in service on the Pittsburgh & West Virginia Railroad are 100% COBRA SHOE equipped. We also have COBRA SHOES on our officials' cars.

Q. How long have you been using COBRA SHOES? And what prompted your Line to try them?

A. Our first unit with the COBRA SHOE went into service June 12, 1958. We decided to try COBRA SHOES after hearing about the good results other railroads were obtaining with this modern composition shoe. And, since we wanted to get away from welding up flat spots, we put your COBRA SHOES on all of our locomotives.

Q. Your COBRA SHOE-equipped power has probably been in service long enough now to draw some conclusions. Would you care to tell us exactly what you think of them?

A. Yes. I have no reservations about your new product. COBRA SHOES are the answer to a lot of problems for a Line like ours. You see, our road power operates over grades which definitely present a problem in braking.

Our COBRA SHOE-equipped locomotives, in constant yard and heavy road service, have averaged 75,000 miles between wheel turnings, which is well in excess of our former experience. *And, to date, we have not had a single case of thermal cracked wheels.*

Furthermore, our Line is a curvy one. Straightaways on the Pittsburgh & West Virginia Railroad are probably not longer than 1½ miles. This provides a good test of flange wear. With COBRA SHOES there is less flange wear—wheels maintain better contour—and wheels last longer.

To sum up, our experience with COBRA SHOES has been highly satisfactory. As far as the Pittsburgh & West Virginia Railroad is concerned, COBRA SHOES have eliminated thermal cracking and flat spots. We are getting four times the shoe life we did with our old type shoes. And wheels retain their standard contour for much longer periods.

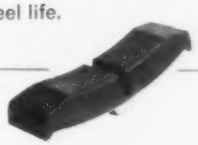
Mr. Mitchell: Thank you, Mr. Kresge. You sound most enthusiastic about COBRA SHOES. Is there anything you'd care to add to your foregoing comments?

Mr. Kresge: Only to remind anyone considering COBRA SHOES that they introduce an entirely new concept in braking and, as with anything new, they require an educational approach on the part of the Road Foreman and Engineman. *Be sure these important men understand just what these new shoes can do.* To get maximum advantage, I also recommend that when applying these shoes to Road Power, that all units of a locomotive should be equipped at the same time.

*Registered U.S. Trademark

That's it . . . and we think you'll agree that Mr. Kresge's comments have been helpful. But, almost every installation or application of COBRA SHOES is different. *Know what you want to do before you do it.* The situation prevailing on one railroad may not exist on another. But, we have accumulated a wealth of information which may exactly match conditions on your Line. At any rate, regardless of the type of equipment you operate or the conditions under which you operate, you can almost assuredly use COBRA SHOES to reduce or eliminate thermal cracking, worn flanges and flat spots. We will be glad to answer your inquiries . . . in person, if you prefer.

COBRA SHOE installations are growing in number and volume. 97 railroads have such installations—16 more have shoes on order. Total units involved are 5313, consisting of 3585 freight cars, 698 passenger cars, 561 subway cars and 469 locomotives. Cumulative data on all types of service, totaling 200,000,000 vehicle miles, parallel Mr. Kresge's experience of four times the shoe wear and greatly extended wheel life.



The COBRA SHOE . . . a product of the combined research facilities of

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Specialists in Braking

JOHNS-MANVILLE CORPORATION
Specialists in Friction Material

RAILROAD FRICTION PRODUCTS CORPORATION *Wilmerding, Pennsylvania*

HOW SOLID BEARINGS AND JOURNAL STOPS HELP KEEP RAILROADS OUT OF THE RED

It's a fact...

that MAGNUS R-S JOURNAL STOPS can cut total hot-box costs to less than 1 cent per car per day!

Operating experience with more than 12,000 *freight cars proves that Solid Bearings and Journal Stops are the low-cost solution to the hot-box problem*

Railroads using low-cost solid bearings and R-S Journal Stops today average over 6,000,000 car miles per hot box. Conservatively, new users of R-S Journal Stops can increase hot box mileage 10 times — can cut hot box costs to a tenth of current costs on similar cars in similar service. That means less than ⅓ cent per car per day to cover all costs associated with bearing road failures.*

That's just one of the facts about R-S Journal Stops, proved now on over 12,000 cars in service. Essentially, they stabilize the bearing assembly, help provide uniform, uninterrupted oil film lubrication, give the solid bearing a chance to work at optimum efficiency.

Results: you double bearing life, reduce wheel flange wear, cut necessary service attention, prevent dust guard damage — in short, save on truck maintenance all along the line. This reduced maintenance alone will save you enough to pay for the Stops in 3 years.

And with R-S Journal Stops, you still have all the other advantages which low-cost solid bearings bring to railroad rolling stock. You can take the maximum load, make the fastest schedule. Lading gets the smoothest ride. You save excess dead weight and get lowest possible running resistance in pounds per ton. Best of all, you'll be sure of the kind of bearing performance you want at a price you can afford to pay. Write us for all the facts. Magnus Metal Corporation, 111 Broadway, New York 6, New York; or 80 E. Jackson Blvd., Chicago 4, Illinois.

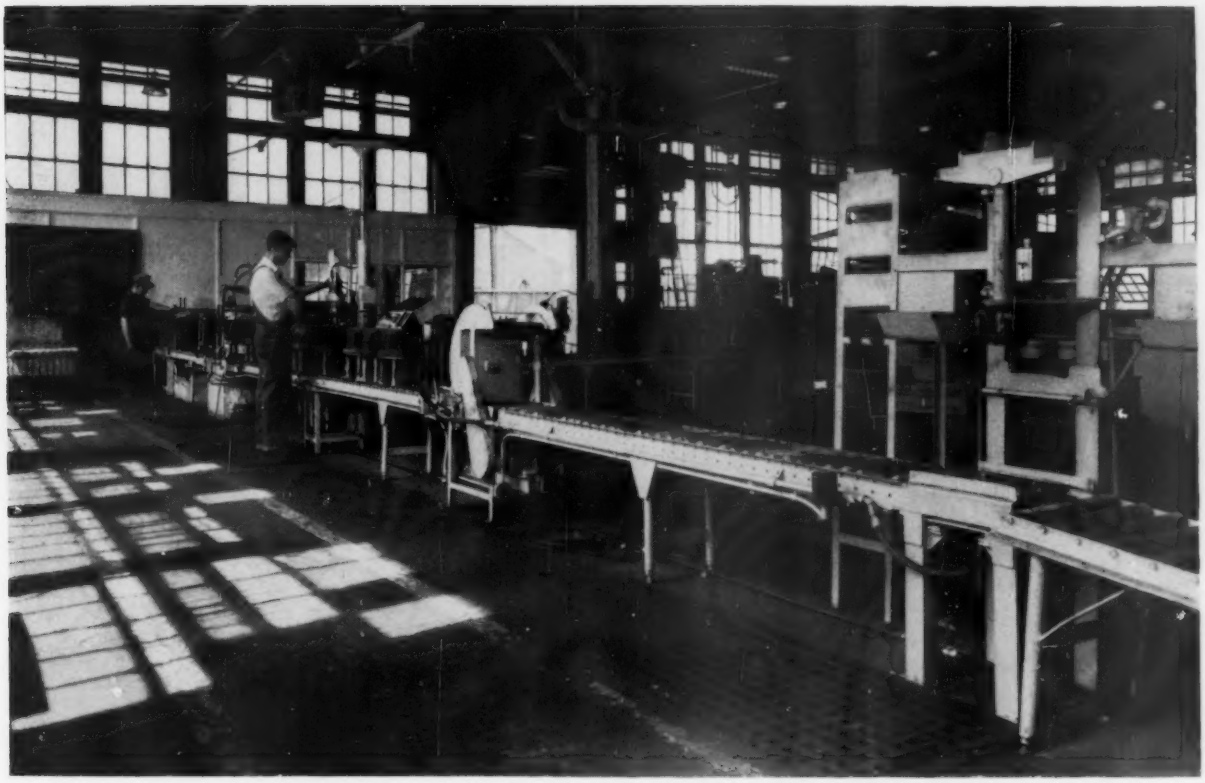
**Cost based on data compiled by the Mechanical Division of the Association of American Railroads in 1955.*

MAGNUS

Solid Bearings

Right for Railroads
...in performance...in cost

MAGNUS METAL CORPORATION *Subsidiary of* **NATIONAL LEAD COMPANY**



Conveyors at convenient working height connect series of devices along production line. Output has been tripled with this arrangement.

Milwaukee Line Speeds Head Repairs

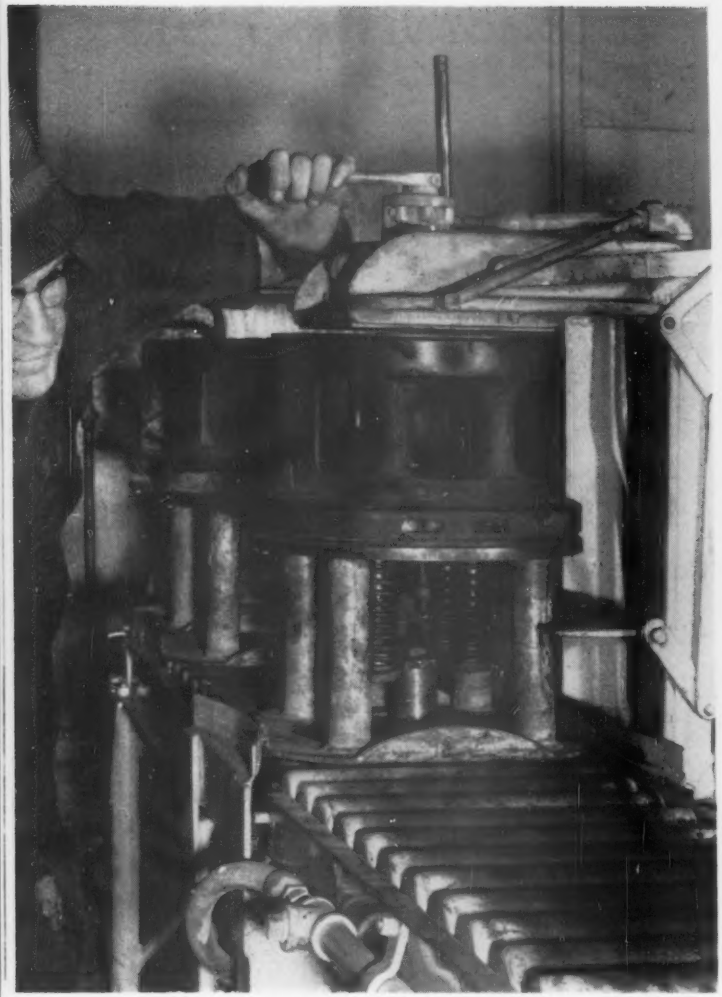
Establishment of production line makes possible big increase in output of reconditioned cylinder heads

A new production line, featuring roller conveyors and extensive use of shop-made hydraulic equipment, has enabled the Milwaukee Road to triple its output of reconditioned EMD 567 B and C cylinder heads at the Milwaukee, Wis., shops. Present production is 35 heads per day. Two machinists operate the line.

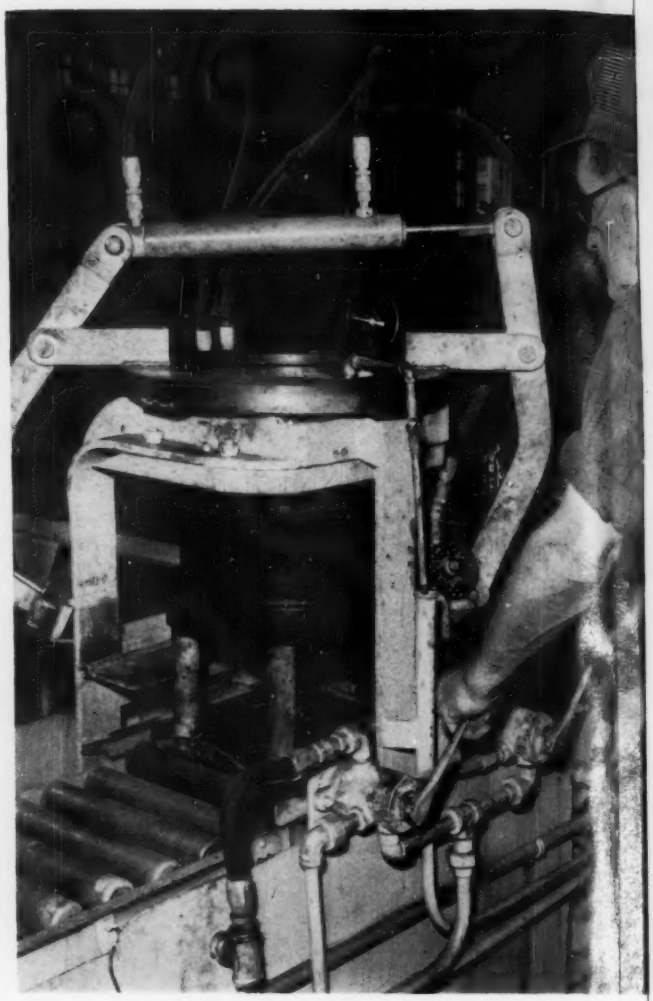
Previously, one machinist was assigned the full-time job of stripping, averaging 15 min per head. A plate was used to compress the springs. One machinist on water tests used a special hand clamp on the side ports, while a pneumatic device sealed off the face ports. This operation took 10 to 15 min per head. One helper cleaned the heads, and wirebrushed the ports and valve cavities. Seat grinding was done by three machinists. There was no particular sequence of operations. Output was about 12 heads per day.

Provision of new facilities and careful planning of the operations has made possible much more efficient overhaul. The heads from the cleaning vat are inverted on special carrier's, placed on a roller conveyor located at right angles to the start of the main production line, and stripped in this position. A hydraulic ram mounted at the bottom of the conveyor line compresses the springs so that the keepers can be removed. When the ram is lowered, the springs fall out. This operation requires about 3 sec per head.

In the first step on the main production line, heads are cleaned with a power-driven wire brush. In the water test position that follows, a hydraulic ram raises the head to seal the face surface against a gasket mounted



Heads are disassembled after being placed on carriers. Ram which comes up through conveyor line compresses springs so keepers can be removed. Heads are then wire brushed before being subjected to water test.



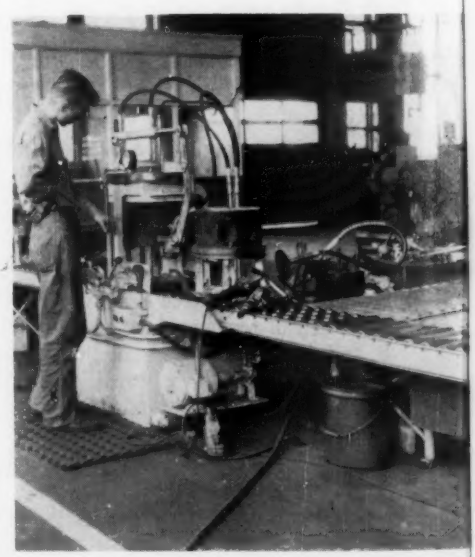
Water test position includes clamps which blank off the water passages on top and side of head so that cracks can be detected. Water is treated with inhibitor and is reused. Pressure is 45 psi.

in the top of the press. Two hydraulically operated arms close off the side ports. The machine has its own water pump and a pressure of 45 psi is developed to test for leaks. Rust inhibitor in the water insures clean passageways. The same machinist strips, cleans and makes the water tests.

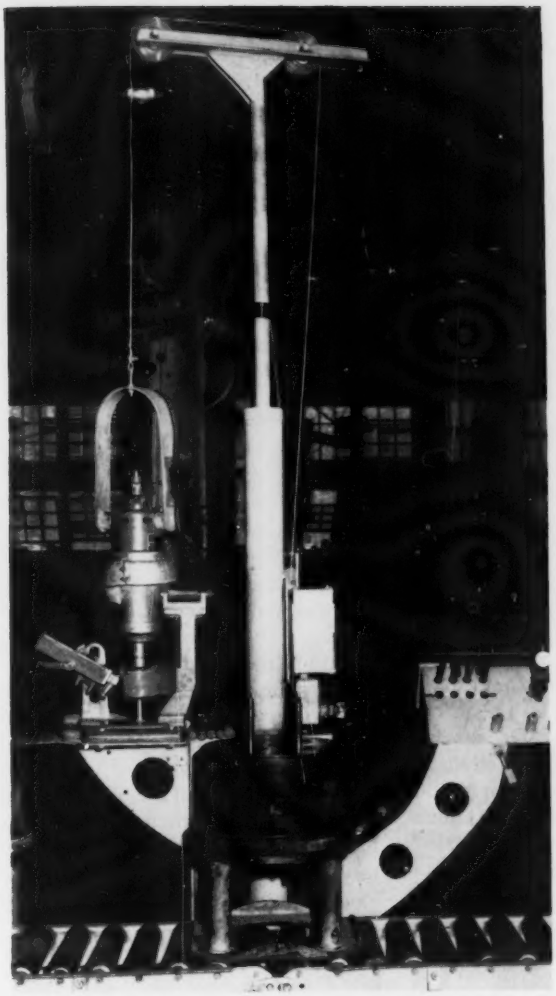
The heads then move to the grinding position. A Hall-Toledo single-head oscillating grinder takes about 3 min per valve seat, or approximately 11 min for each head. The valves, which are racked at this spot in skids, are then inserted and a circular plate applied on the head. The turnover machine, operating through an arc of 180 deg, places the heads with the valve faces down, on a plate which is lined with pressed board to protect the valves.

The carrier is then removed and the stud holes are chased. A Procunier tapping head having a quick-acting chuck is used. It is combined with the head portion of a bench drill press, and mounted on a vertical shaft to give the same action as a vertical drill press. This operation, plus the valve grinding technique, is expected to increase production up to as high as 45 heads per day.

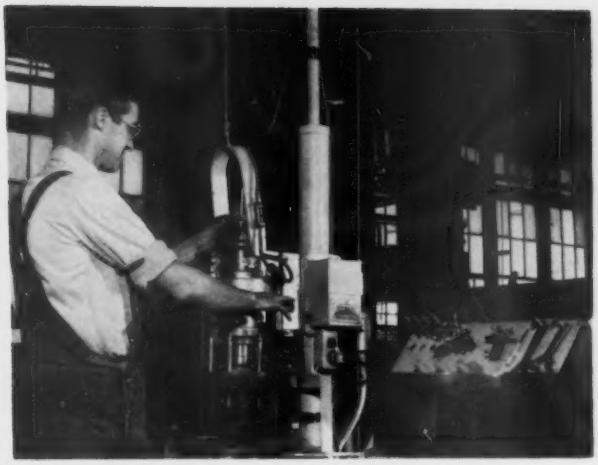
In the final operation at the assembly line, the valve springs and spring washers are applied. A hydraulic ram compresses the springs. A U-frame magnet, mounted in the machine, facilitates the application of the keepers to the valve stem. It is designed so that the ends of the magnet will contact the valve ends, magnetizing the valves to hold the keepers in place during assembly.



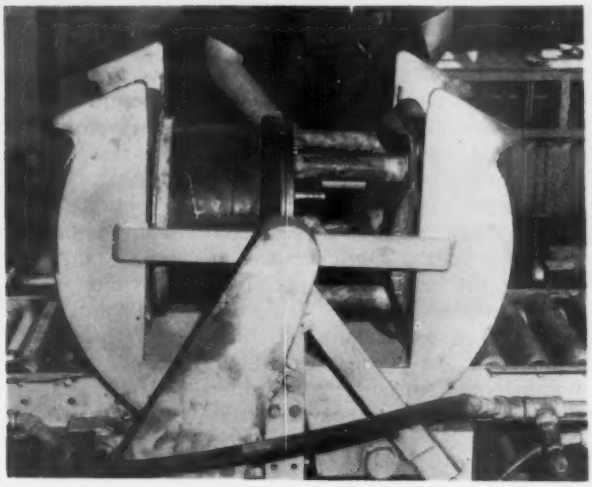
Heads rejected at water test are placed on side conveyor for inspection and repair.



Grinding position on production line has Hall-Toledo grinder suspended from overhead swiveling support. Tools and grinders are mounted on convenient stand at right of column.

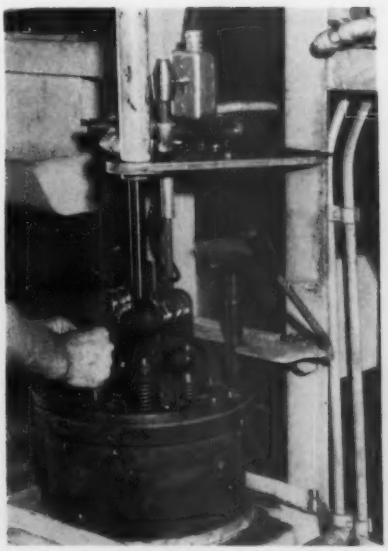


Valve seat grinder is at convenient operating height. When not in use, it is raised and swung back to storage position at left of column.

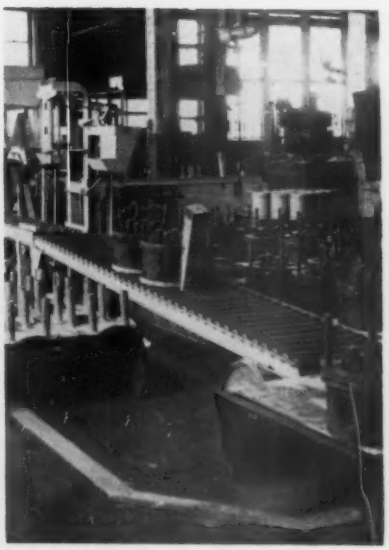


Turnover device inverts head after valves are applied. Carrier is removed after the head has been placed valve-side down on conveyor.

Springs and washers are applied to head; they are then compressed so keepers can go on.



U-frame magnet simplifies application of keepers by magnetizing valve stems during job.



Assembled heads are loaded directly on shipping skids at the end of production line.

What Cobra Shoes Do for P&WV

All 26 road switchers on the Pittsburgh & West Virginia have been equipped with Cobra composition brake shoes since last February. These 26 Fairbanks-Morse locomotives represent the entire motive-power fleet of this hilly, 132-mile road. With over a half year's all-Cobra operation, the following results have been obtained:

- Thermal cracking of locomotive wheels has been eliminated;
- Composition shoes are lasting four times as long as cast-iron shoes;
- Wheels retain their AAR contour longer, and slid flats or built-up treads no longer occur.

This entire composition shoe program got under way in mid 1958 following the issuance of ICC Ex Parte 174 which bans welding on the wheels of locomotives in road service. All the P&WV 1,600-hp and 2,000-hp road switchers may be used on yard or road assignments. This meant there could be no welding, and the road has no facilities for turning wheels in place. In addition, the P&WV could not justify a wheel-profiling machine. It did turn out that an expenditure of under $1,000 per unit would purchase the Westinghouse Air Brake composition shoe conversion kit and pay the installation costs. Between June 1958 and February 1959, all the locomotives were equipped with composition shoes (RL&C, September 1958, p. 72).

The results now being obtained were not achieved without some initial difficulties. Because of the higher coefficient of friction, it is necessary to reduce the braking force. This is done by bushing the cylinders and installing pistons wth smaller areas. Actually, the cylinder pressure is increased in this installation to give a greater differential between the applied and released positions, insuring positively that shoes will move away from wheels when released. The higher application pressure led to some of the P&WV difficulties. Other problems arose from the constant frictional characteristics of the shoes.

According to W. C. Kresge, general superintendent, switching to Cobra shoes requires cooperation between the transportation and mechanical departments until the initial impacts of the installation are over. He stresses that road foremen should be educated on what the shoes will and will not do. This must be followed by an educational program with the enginemen.

Independent air pressure on all P&WV locomotives is now set at 60 psi. This is 25 psi higher than the pressure used with iron-shoe units. This meant that during the installation program care had to be taken not to have a unit with composition shoes as the lead unit of a locomotive having some units with iron shoes. If this precaution were not taken, wheels of the iron-shoe units could be locked and slid flat. Mr. Kresge recommends that complete multiple-unit locomotives be equipped with Cobra shoes if possible and that units with composition shoes otherwise be operated as B units.

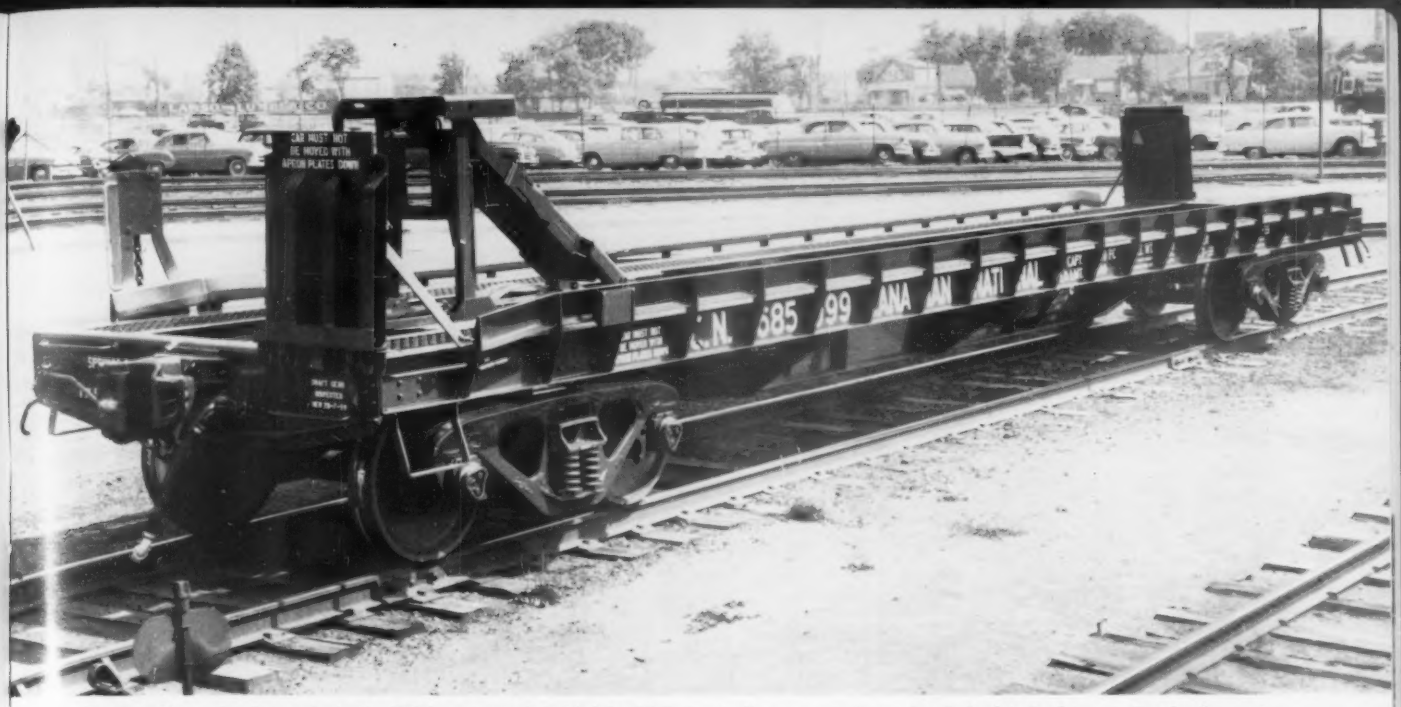
The constant frictional characteristics of the shoes necessitated an educational program with enginemen. After an epidemic of slid flat spots developed on the composition-shoe units, investigation showed that enginemen had raised the independent brake pressure by 10 psi or more on 12 of 14 units checked. The setting of 60 psi will give about the maximum possible braking effort. Very small increases will result in locked wheels.

The increasing coefficient of friction on iron shoes at low speeds results in many locked wheel stops. It was the inability to lock wheels of units with composition shoes at the 60 psi setting that brought enginemen to stepping up the independent brake pressure. The result was that these wheels could be locked at speeds which would develop serious flat spots. It was finally necessary to seal the adjustment at 60 psi and make the enginemen responsible for broken seals. The flat spot epidemic ended immediately.

From this, it developed that enginemen use the independent brake more than necessary. Despite its frequent and heavy grades, P&WV locomotives do not have dynamic braking. Road foremen are stressing greater reliance on train brakes rather than on locomotive brakes. This makes possible cooler wheels and produces smoother train operation. Several of the storage tracks of this railroad are on a grade and it was found that, in recharging cars which were stored for any length of time, it was necessary to keep the hand brakes applied until the trainline was charged and an automatic brake application made. This showed up after units with Cobra shoes were moved by trains they were trying to hold with independent applications alone.

Once the operating problems were resolved, the composition-shoe installations proved extremely satisfactory. Both wheel and shoe life is being extended significantly.

Rugged P&WV route has been proving ground for composition shoes. P&WV's four-axle Fairbanks-Morse road switchers are all equipped with AAR Class B wrought-steel wheels.



Single-trailer car has been adopted by CNR because road decided the 85-ft, two-trailer cars may be rendered obsolete by future trailer developments.

CNR Cuts Piggyback Car Weight

The Canadian National has now put into service most of its 400 new lightweight 46-ft piggyback cars. They were built by National Steel Car Co. at Hamilton, Ont. The design for these cars originated with the CNR mechanical and technical research departments. One aim was to reduce lightweight well below that of the converted standard flat cars which the road has been using in piggyback service.

Average lightweight for these cars is 36,800 lb. Each car can carry a single trailer of up to 40-ft length with a gross weight of up to 66,000 lb. In choosing to build a new car which can carry only one trailer, the CNR duplicated the decision of the Canadian Pacific which has ordered 700 cars of its own 46-ft design over the past two years (RL&C, June 1959, p. 62). Current U.S. practice is to build 85-ft cars capable of handling two 40-ft trailers.

Full-width decking has been eliminated in this design and the use of low-alloy, high-tensile steel produces a car which is low in weight and can still withstand service loads imposed by piggyback operation. The center sill for the car is a type of fish-belly produced by slitting AAR 36.2 lb per ft Zee sections and welding in 7/16-in. web plates to give a section of 28-in. depth through the center of the car. A 7/16-in. thick top cover plate is welded to this sill between the car bolsters. This design made possible a substantial weight reduction.

Welding is used extensively throughout the car. Bolsters are welded box-section assemblies. Two of the crossbearers are located 9 ft 2 in. inboard of the bolsters and the third is on the center line of the car. These three fabricated crossbearers extend down to the bottom of the 28-in. fish-belly section of the center sill and are welded to it. The sill is reinforced at these points by 3/8-in. plate separators and the crossbearer assemblies are tied at their tops by 7/16-in. tie plates which pass through the center sill and are welded to it. These crossbearers are riveted to the side sills.

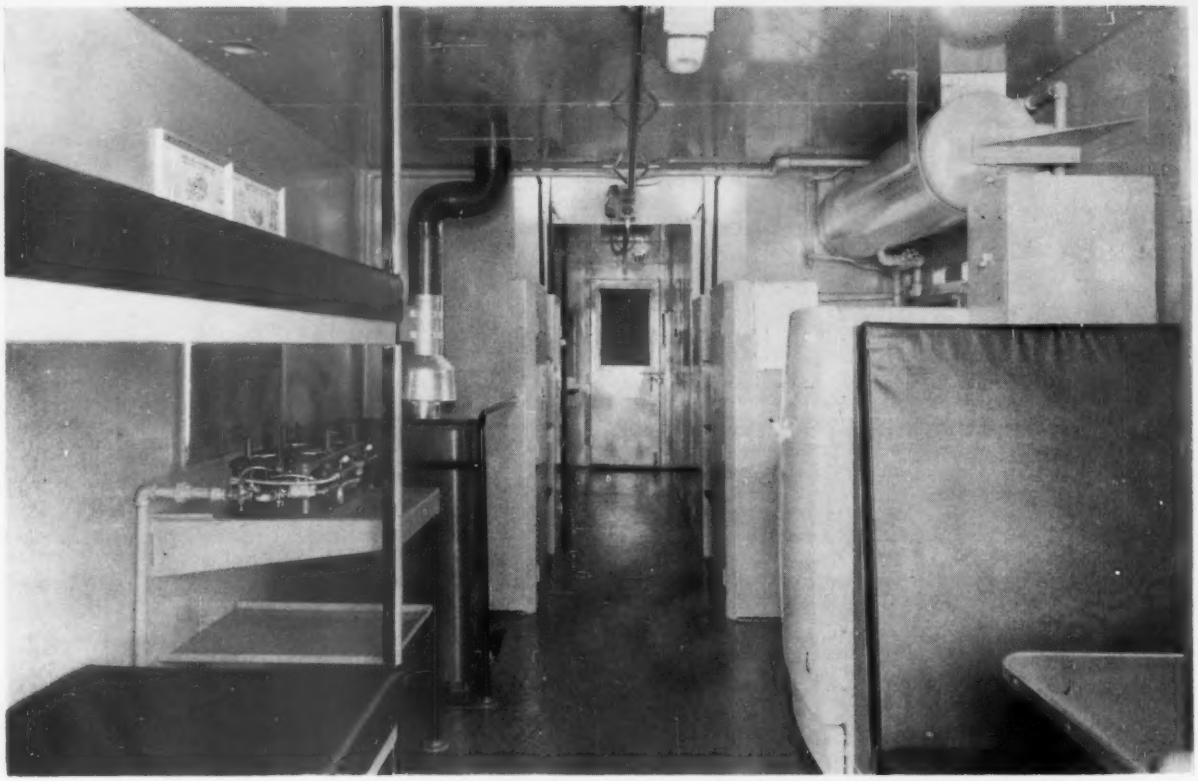
The five crossties between the bolsters are formed from 5-in. I beams which extend out from the center sill to the side sills. Like the crossbearers, they are welded to the center sill and riveted to the side sills.

The two floor stringers, which support the inner edges of the two 16-in. strips of Rectagrid decking, are formed of 4-in. I beams which extend the full length of the car between the end sills. The stringers are welded to all crossmembers. The grid decks, spaced to carry the tires of tractors and trailers, are also secured to the crossmembers. The side sills are 10-in. wide-flange I beams.

The Canadian National uses the ACF trailer hitch. On these cars, it is centered 4-in. inboard of the A-end bolster. Between the first crosstie and the first crossbearer inboard of this bolster, there are four lengths of the 4-in. I beam which strengthen the floor stringers and provide a larger area in the vicinity of the landing wheels.

The car is 46 ft 8 in. over striking castings and 8 ft 2 in. in width over side sills. From the rail to the top of the grid decking is 3 ft 7 in.

Elimination of full-width decking was one way of cutting weight of this CNR piggyback car.



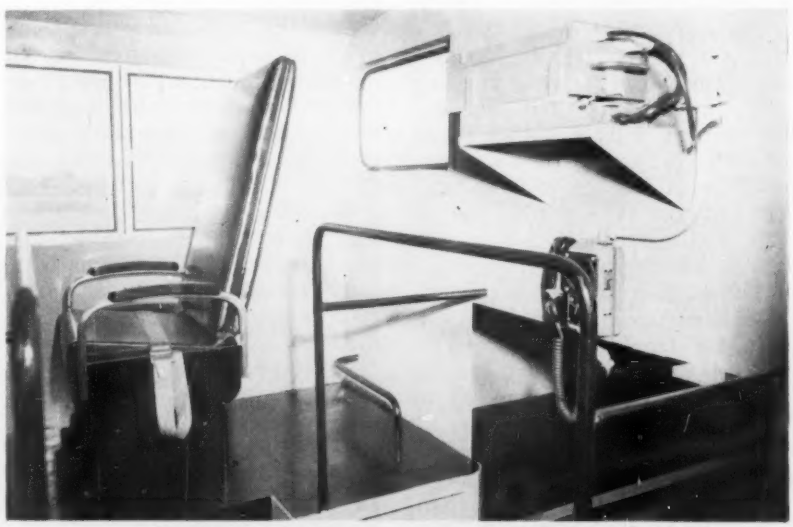
Comfort and convenience are stressed in interior of D&H caboose. Cars comply with state regulations in territory where they operate.

Safety and Comfort in Cabooses

Extra-wide cupolas, welded construction, and facilities for greater crew comfort are among the features of ten cabooses recently delivered to the Delaware & Hudson. Assigned to Wilkes-Barre, Pa.-Oneonta, N. Y. freight operations, the cars are used on all D&H freight trains in Pennsylvania, except for local runs. The cars meet or exceed all ICC or AAR standards and recommendations. They fully satisfy state labor caboose-car regulations and sanitation laws in effect in D&H territory.

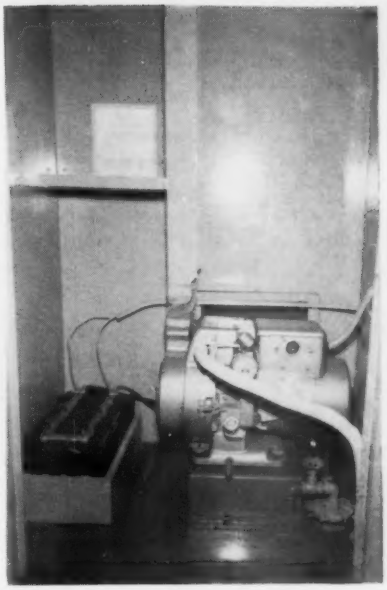
Built by the International Car Division, Morrison International Co., the design features the manufacturer's extra-wide-vision cupola. A Lincoln submerged-arc automatic machine was used in welding the longitudinal seam between the two 51.2-lb center sill sections. Final assembly of the underframe was done with the aid of a special jig. Some riveting is employed to secure the rear draft lug and the body center casting to the underframe and to join the striker and front lugs to the center sill. The underframe is equipped with Miner rubber draft gears of freight capacity to withstand heavy helper service. Trucks are of a Barber-Bettendorf, special swing-motion design for cabooses. They have one-wear wheels, 5- x 9-in. axles, R-S journal stops, and Magnus lubricator pads.

Collision posts, equal to the requirements of new passenger equipment,



Extra-wide cupola has high-back, walk-over seats with safety belts. Radio handset is mounted so as to be convenient for crew members.

Special swing-motion caboose trucks are used under these cars.



Engine compartment houses the 2-kw alternator, its propane engine, and the 12-volt battery.

are 6-in., 25-lb-per-ft H-beams. Body side posts consist of 3-in., 6.7-lb-per-ft Z-bars. Body side frames are reinforced by belt rails.

Sides, fabricated from 10-gage sheet steel, were assembled on jigs. Side assemblies were then tacked to the body framing by use of Aircomatic spot welding to prevent buckling. The final application of the exterior side sheets to body framing was made by submerged arc automatic welding. The 14-gage inside lining sheets were applied to body framing by spot welding.

Diagonal panel roofs are of 14-gage steel and are attached by pull-type rivets. The W-section side plates are welded to the body side sheets and to the body side posts. The interior 14-gage ceiling is attached with self-tapping screws to car-width ceiling hangers. To minimize extremes in temperature, a 3-in. layer of fibre glass insulates body and cupola sides, ends and roof.

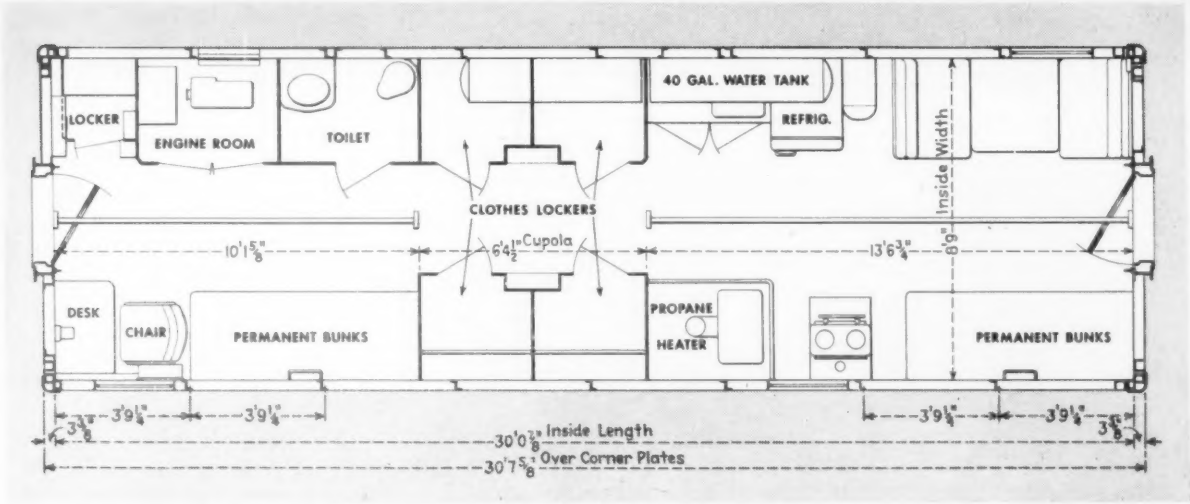
The floor is of double construction, consisting of a 1¾-in. tongue-and-groove decking laid crosswise of the car and secured with three watertight bolts through each plank. Over this sub-floor is a coat of paint; one layer of 90-lb Mulehide paper, and a 25/32-in. tongue-and-groove floor. An asphalt-type floor covering is applied throughout the car body.

A 12-gage sheet-steel toilet and washroom compartment is equipped with stainless-steel flushing hopper and stainless-steel lavatory. Water is supplied by gravity from an overhead steel tank which is strapped to the ceiling. It is filled from the outside through an under-floor connection. Another compartment contains the engine-driven alternator and battery.

All windows, except those facing forward or backward, slide open for

Partial List of Materials and Equipment

Trucks	Standard Car Truck Co.
Side bearings	A. Stucki
Wheels and axles	United States Steel Corp.
Air Brake equipment	New York Air Brake Co.
Brake adjuster	Charles M. O'Boyle
Brake shoes and keys	American Brake Shoe Co.
Brake-beam wear plates	Unit Truck Corp.
Brake badge plate	Leitelt Bros.
Brake rigging	Schaefer Equipment Co.
Hand brake	Ellcon-National, Inc.
Brake beams; bottom-rod guards	Chicago Railway Equipment Co.
Couplers, yokes and strikers	Buckeye Steel Castings Co.
Coupler release rigging	Standard Railway Equipment
Draft gear	W. H. Miner, Inc.
Draft-gear carrier	Central Railway Supply Co.
Draft-gear keys	ACF Industries, Inc.
Draft-key retainer	Illinois Railway Equipment Co.
Draft lugs; center plates	Clifford-Jacobs Forging Co.
Springs	Winamac Steel Products
Journal-box lids	Alco Products, Inc.
Journal bearings; stops; lubricating pads	Magnus Metal Corp.
Journal wedges	Pullman-Standard
Dust-guard seals	Hennessy Lubricator Co.
Dust-guard plugs	Equipment Research Corp.
Running boards and platform steps	United States Gypsum Co.
Roof; side plate	Standard Railway Equipment
Lock nuts and floor bolts	MacLean-Fogg Lock Nut Co.
Floor insulating paper	Lehon Co.
Door and window sash; door latches	Adams & Westlake Co.
Insulation; window glass	Pittsburgh Plate Glass Co.
Tee anchor; pipe clamps	Illinois Railway Equipment Co.
Battery	Electric Storage Battery Co.
Lights	Luminator, Inc.
Marker lights; standby receptacles	Pyle-National Co.
Propane-gas refrigerator	Whirlpool Div., RCA
Propane generator	D. W. Onan & Sons, Inc.
Propane cabinet	Waukesha Motor Co.
Propane tanks	Pressed Steel Tank Co.
Water tanks	Scaife Co.
Water filling nozzles	Eastern Malleable Iron Co.
Cushions; seats; curtains	Hyman Freedman Co.
Cupola seats	Coach and Car Equipment Co.
Paper and towel holders	Scott Paper Co.
Drinking-water container	Ajax-Consolidated Co.
Drinking-cup dispensers	United States Envelope Co.
Hoppers; lavatory; stove; sink; hot plate	Mink-Dayton, Inc.
Smoke jack	Brighton-Dickinson Div.
Oil	Shell Oil Co.
Back-up whistle	Sherburne Co.
Paint	E. I. du Pont de Nemours & Co. Patterson-Sargent Co.



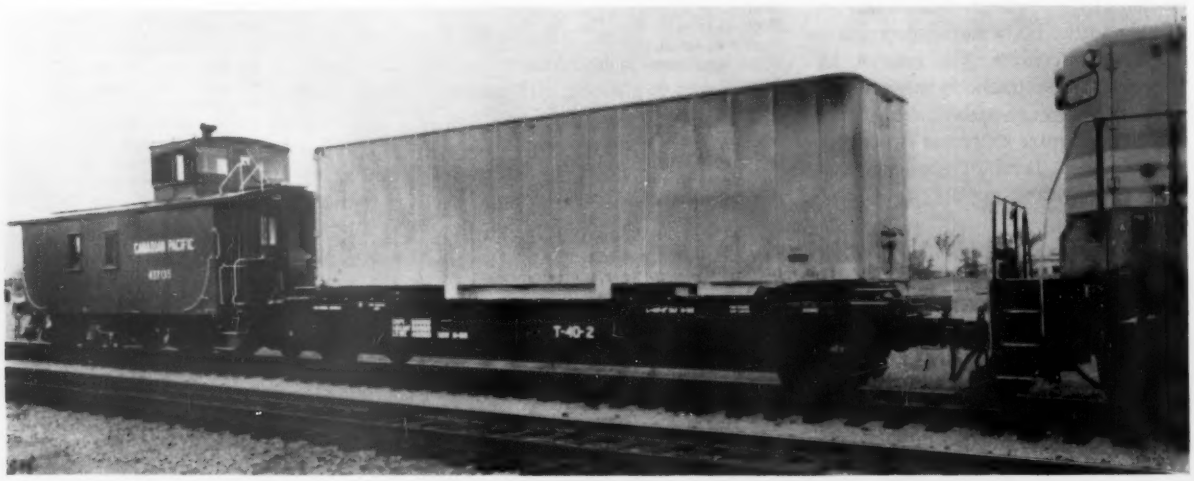
Floor space in the car is completely utilized. Heating, power and refrigeration are all supplied by propane-fueled equipment.

ventilation. They are of laminated safety glass, have aluminum sash, and are equipped with aluminum screens and roller shades. Fixed windows are mounted in rubber seals.

The 110-volt a-c power for the car is supplied by an Onan 2-kw alternator driven by a propane engine. There are 110-volt fixtures in the cupola, on the car ceiling, at the conductor's desk, and in the toilet and engine compartments. Marker lamps are lighted from an Exide LX-4B battery on a special 12-volt circuit. Standby power is provided by plugging in 110-a-c from regular outside power sources. Radio communication is provided by a Motorola two-frequency set. There is also a rack for a walkie-talkie.

Heat is supplied by a propane-gas space heater of 53,000 Btu capacity. Kitchen appliances include a propane hot plate and a 6-cu ft propane-gas refrigerator. Gas is supplied from a Waukesha propane cabinet containing three 100-lb capacity tanks mounted under the car. Seat and bunk cushions are polyfoam upholstered in black vinyl plastic. The conductor's swivel chair, the dining section seats, and the cupola seats have 52-in. backs for comfort and safety.

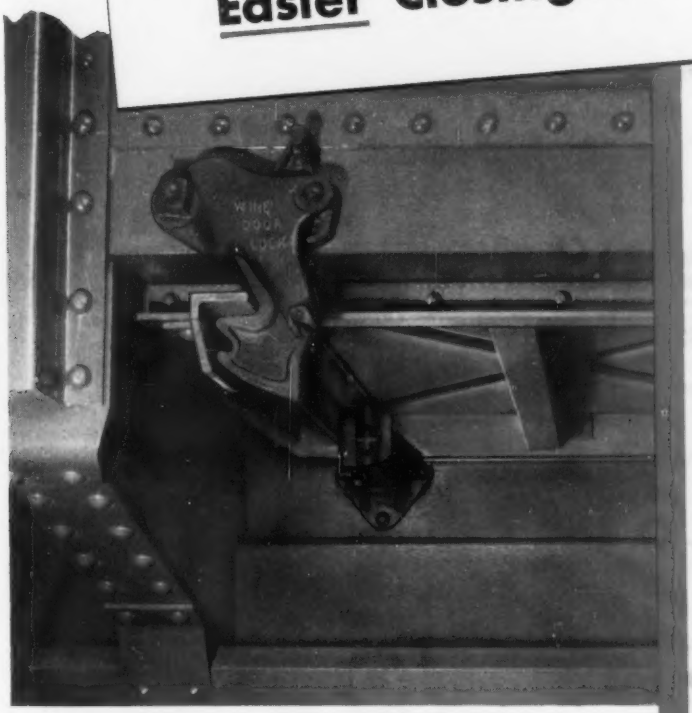
CPR and GMD Design Piggyback Car



Prototype four-wheel flat car for piggyback service has been sent out for evaluation testing on the Canadian Pacific by General Motors Diesel Ltd. GMD and CPR cooperated in producing new design. Car carries a Strick container here, but is intended to carry various containers without wheels. It can be loaded from either side as is done with FlexiVan.

New car is GMD's first venture into piggyback equipment. GMD president E. V. Rippingille, Jr., says "piggybacking . . . is the fastest growing source of railway carloadings . . . As Canada has been in the forefront of this development, it is logical we should do our utmost to advance the art in Canada and keep even more freight moving by rail." CPR has largest individually owned piggyback car fleet. It has acquired 700 cars of 46-ft length over the past two years (RL&C, June 1959, page 62).

Controlled Unloading — Easier Closing...



WINE DROP DOOR

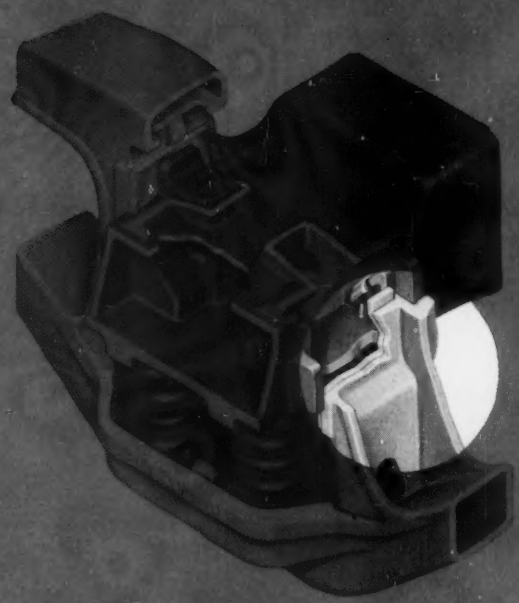
Spring Hinges and Adjustable Locks

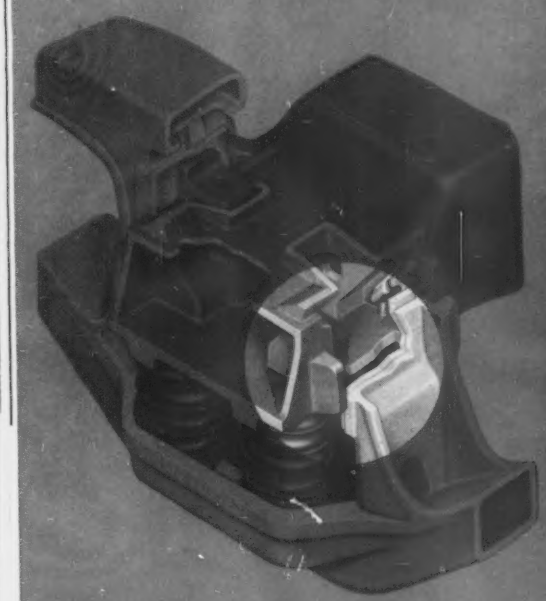
- DURABLE, CAST STEEL PARTS
- SIMPLIFIED DESIGN AND APPLICATION
- INDIVIDUAL, POSITIVE DOOR FIT
- MINIMUM SERVICE COSTS

For All Drop Door Gondolas...

NEW **Larger friction-control surfaces**

Larger angle surfaces on bolster and larger shoe equalize wear for longer truck life.

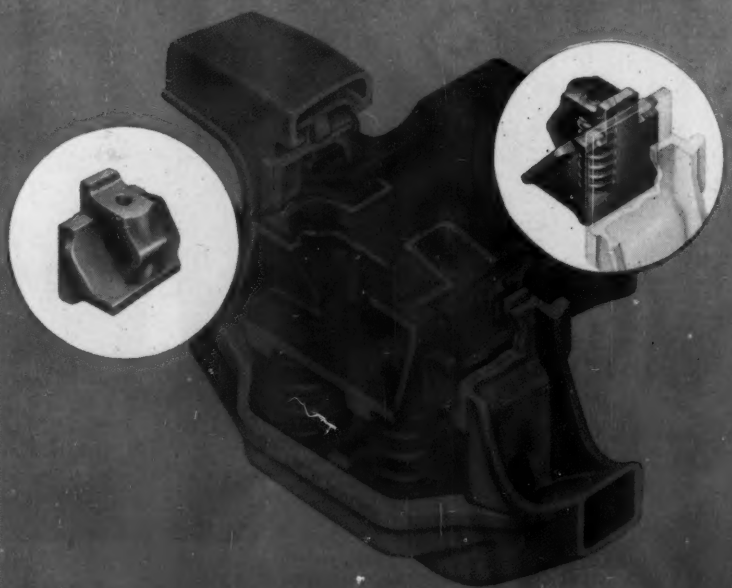




NEW

NEW **Wing shoe is shell-molded**

Larger areas—plus ASF's precision casting process that results in smoother surfaces and closer tolerances. New longer-wearing steel, too.



NEW Superior bolster control

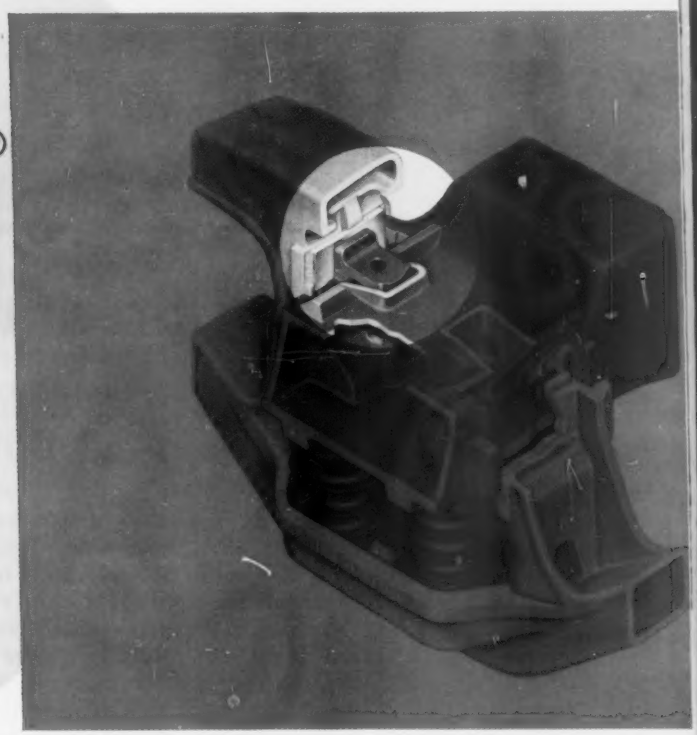
Longitudinal, lateral and rotary movement of bolster are under constant control. Ride-Control elements stay in proper position for improved ride and increased truck life.

NEW Column wear plate with high weldability

Steel composition and heat treatment developed for wear resistance, yet the plate is readily weldable.

ASF Ride-Control® Truck

...now better than ever



Here is the biggest step forward in truck design since the first of more than one million Ride-Control Trucks pointed the way to modern freight service. With the improvements presented on these pages, the new ASF Ride-Control Truck is better built to ride better longer and cost less to maintain.

These new features were designed in ASF Research Laboratories and tested and proved under operating conditions on the ASF Service Laboratory Test Train. They are further examples which show you how ASF Research and Development continues to work to give you better products that save you money.

ASF

AMERICAN STEEL FOUNDRIES

Prudential Plaza, Chicago 1, Illinois

Canadian Manufacturer and Licensee: International Equipment Co., Ltd., Montreal 1, Quebec
Other Foreign Sales: American Steel Foundries, International, S.A., Chicago

Trouble-free operation of steam generators can be assured with adequate preparation. Boston & Maine E unit is handling New England snow train.

Winterizing Steam Generators

Generators, tanks and piping must be protected against freezing; layover protection is needed

STEAM GENERATORS must be protected against freezing when shut down during cold weather, and the water tanks and piping protected at all times. The steam generator combustion air intake is usually located on the roof of standard road units. Repair of faulty safety valves minimizes steam and moisture around the air intake which may clog the screen with ice. In addition, the ½-in. mesh screen used on older locomotives can be replaced by a 1-in. mesh screen or the screen can be replaced by rods welded vertically and spaced about 2 in. apart. In extreme cases, a combination of air intake and exhaust arrangement is available. With this arrangement, the combustion air is drawn around the boiler exhaust stack into an air box connected to the boiler inlet. The melted snow is drained through a line connected from the bottom of the air box.

Care should be taken in the use of engine room air for steam generator combustion because insufficient air will affect steam generator operation. Combustion fumes can back up into the engine room from the air intake during the off-fire cycle if the generator is not equipped with a continuous operation (delayed adapter) feature. With this arrangement, the blower and pumps operate continuously whether the generator is on the "Fire" or "Off Fire" cycle.

With continuous blower operation, the combustion chamber and stack are cleared of exhaust fumes during the "Off Fire" cycle. This feature can be applied to any 1600, 2250, 2500, 3000, 3500 or 4000 lb Vapor steam generator. Elesco steam generators are not affected, because the blower continues to operate during the "Off Fire" cycle.

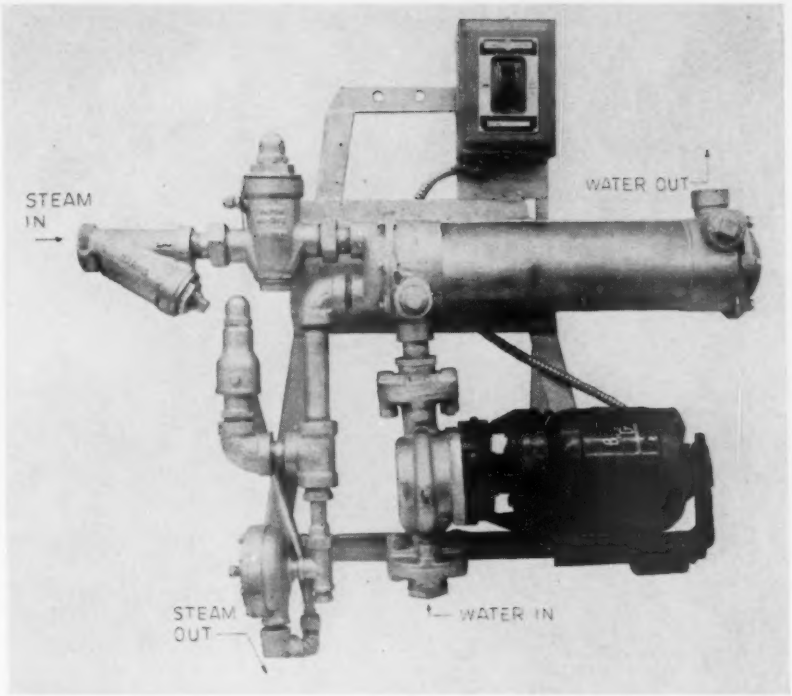
Air dampers tend to bind on some of the earlier Vapor generators. A shielded self-aligning bearing can be applied. Spraying the steam generator intake duct with an insulating material has relieved condensation problems. Moisture grounds, such as arcing across the transformer terminals and the ignition electrodes, frequently result in steam generator failures. Insulating boots can be applied around the terminals and electrodes. A new style burner head with longer electrodes, widely spaced to help overcome arcing, is available. In general, the steam generator manufacturer has a modernization program which brings the older models up-to-date.

Various schemes for protecting the steam generator, tanks and piping were tried on the early locomotives. None were as good as the latest simplified protective system. In normal winter operation now, a single valve protects the entire steam generator and its piping, eliminating either the danger of freezing or excessive heating of

This is the second of two installments on procedures developed by Electro-Motive Division for protecting locomotives which must operate under winter conditions.

the water. A two-way check valve is included so that steam from either the trainline or the steam generator automatically supplies protection for multi-unit operation. When the steam generator is in "layover", steam flows through the generator coils in the same direction as the steam flow during generator operation. The steam condensate discharges through the return water line into the water tank.

On the early Vapor steam generators, no provisions were made for protecting the water pump and controls from freezing. A steam line can be added in series with the steam tracer circuit to protect these assemblies. This arrangement is applicable to the 2,250 lb generator. It also applies to the early 1,600, 3,000 and 3,500 lb generators with the exception that the water by-pass control must also be protected. The preferable alternate is to apply a cabinet with a heating coil in the bottom under the controls and pump. The cabinet can be applied to all Vapor generators not so equipped. Roof overflows are now eliminated wherever possible. Elimination of the check valves from the fill lines permits the fill line to be used as an overflow line and requires the application of new style filler doors.



Steam heat exchanger keeps engine cooling water warm during layovers. Pump circulates the water to provide protection throughout the locomotive water passages.

Filling Tanks

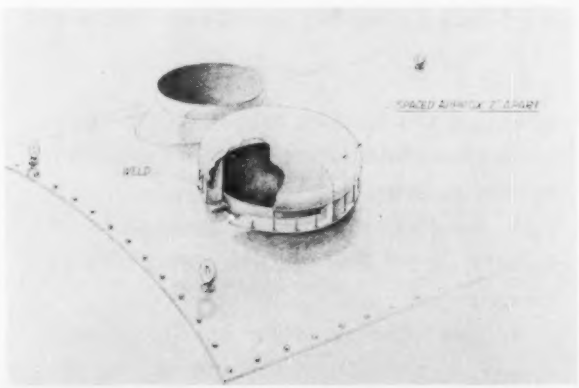
To protect the attendant from water overflow when disconnecting the hose after filling the water tanks, the watering facilities should be equipped with a means to drain the hose when the supply valve is closed. For field conversions of the older locomotives, arrangements include all of the features that are incorporated in the new production units. The steam tracer circuit is modified for each steam generator and piping arrangement. Generally the same scheme is followed. One valve supplies the steam to protect all of the water piping.

An automatic steam trap can be applied in the steam line just ahead of the end valve to protect the main steam line and the connector on the end of the unit not coupled to the train. This trap drains steam condensate from the steam line. When replacing the main steam line on the older passenger units, the copper steam line and expansion joint should be replaced with an iron steam line and flexible connections. The latest methods of insulating and supporting the steam line should be used. Insulating boots can be applied over fittings.

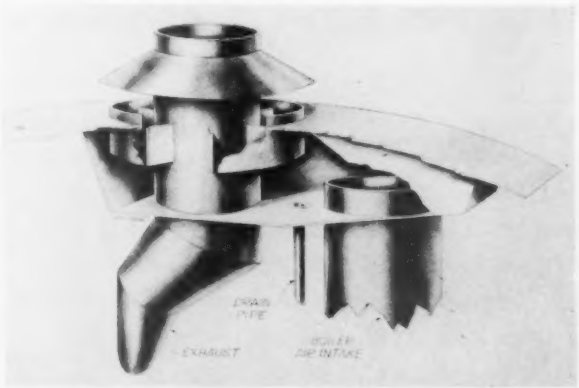
Stand-by Protection

Heating facilities must be maintained when operating a dual-service locomotive in freight service so that the unit can be transferred back to passenger service without complications. When operating in freight service, the steam generator must remain in stand-by condition. Several stand-by arrangements are available for protecting the generator, water tanks and

(Continued on page 38)



Larger openings provided by rods welded 2-in. apart can replace the ½-in. mesh screen on older generator air intakes.



Combination air intake and exhaust arrangement furnishes warmed air which melts snow carried on air stream to generator.

General Motors Locomotives Cut

The Union Pacific Railroad for more than six months has been operating a group of 20 General Motors model F9 freight locomotives. They look like any other group of F9's on the Union Pacific, but there's this big difference: each is equipped with maintenance-saving features of the new line of General Motors locomotives, just recently announced. The Union Pacific, in cooperation with Electro-Motive, undertook the field testing of 28 cost-saving features in a special project to confirm the reduced maintenance schedules which will be in effect on the new models.

The record to date: satisfactory performance at a 60 per cent reduction in scheduled maintenance!

The field-tested, cost-cutting components on the U.P. F9's are basic equipment on the two new series of General Motors locomotives. They offer positive reasons why *now is the time for a giant stride in motive power.*

Report from the Union Pacific . . .

Scheduled Maintenance 60%

For details on the savings you can derive from locomotives containing these reduced maintenance features, contact your Electro-Motive representative.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS · LA GRANGE, ILLINOIS
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More power at less cost with General Motors great new line of locomotives—

1800 hp General Purpose GP-18 | 1800 hp Special Duty SD-18 | 2000 hp General Purpose GP-20 | 2400 hp Special Duty SD-24 | 1325 hp Road Switcher RS-1325

Winterizing Steam Generators

(Continued from page 35)

piping. The most desirable is one which protects the individual unit. This provides the simplest piping arrangement.

Stand-by arrangements can be added in the field and require some slight modifications to locomotive piping. The aim is to maintain the water in the tanks and adjoining lines at a pre-determined temperature automatically when the unit is in freight service and no trainline steam is needed. This is done by automatically firing the steam generator occasionally to meet thermostat requirements and heating the water in the tanks which act as heat reservoirs. The water is then circulated through the piping, generator and tanks.

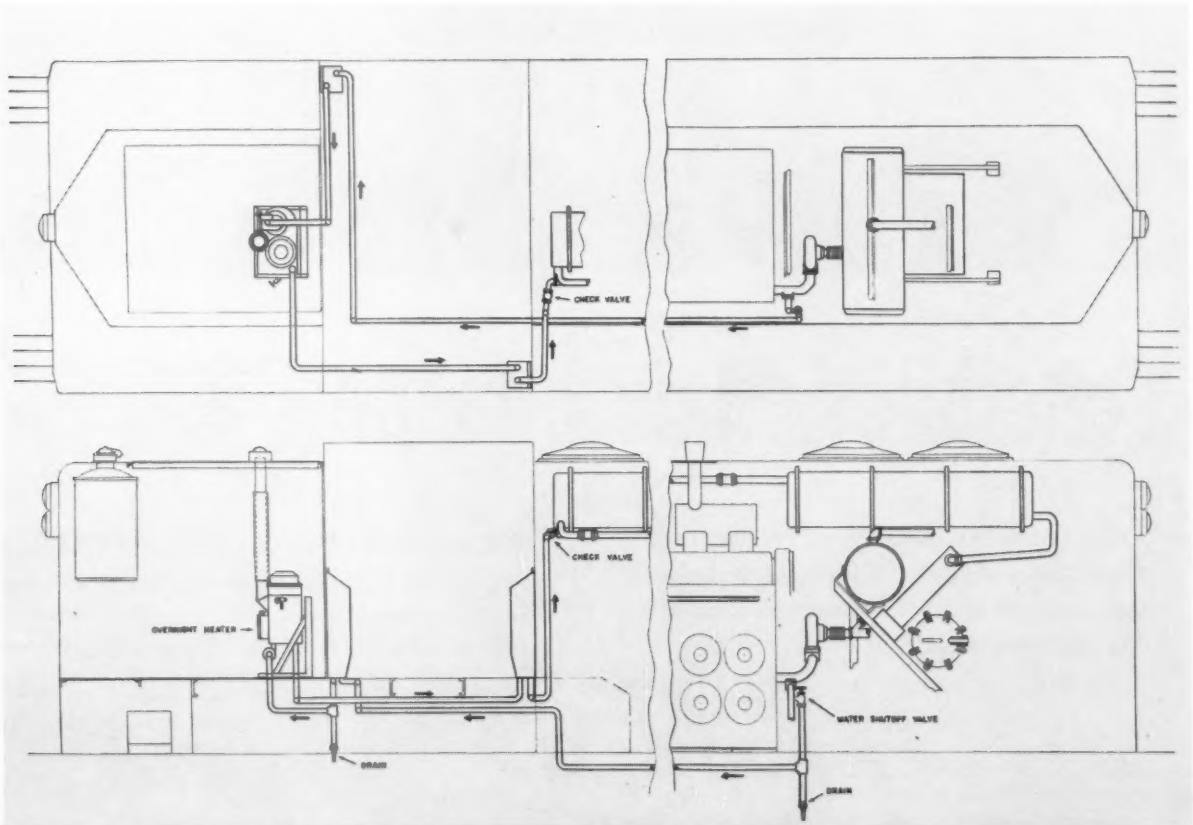
On the F3, F7, and F9 units used mostly in freight service, it would be impracticable to operate the steam generator for long periods without trainline requirements. It is possible to drain the steam generator, piping and all water tanks except the 1200-gal. deck tank. Air connected to the water piping will eliminate moisture from the steam generator and piping. Where danger of freezing the water in the deck tank exists, a 3-¾ kw electric immersion heater can be applied which operates on 74 volt d-c current. A double-throw main switch should be applied so that either the steam generator or the electric immersion heater can be operated, but never both at the same time.

Layover Protection

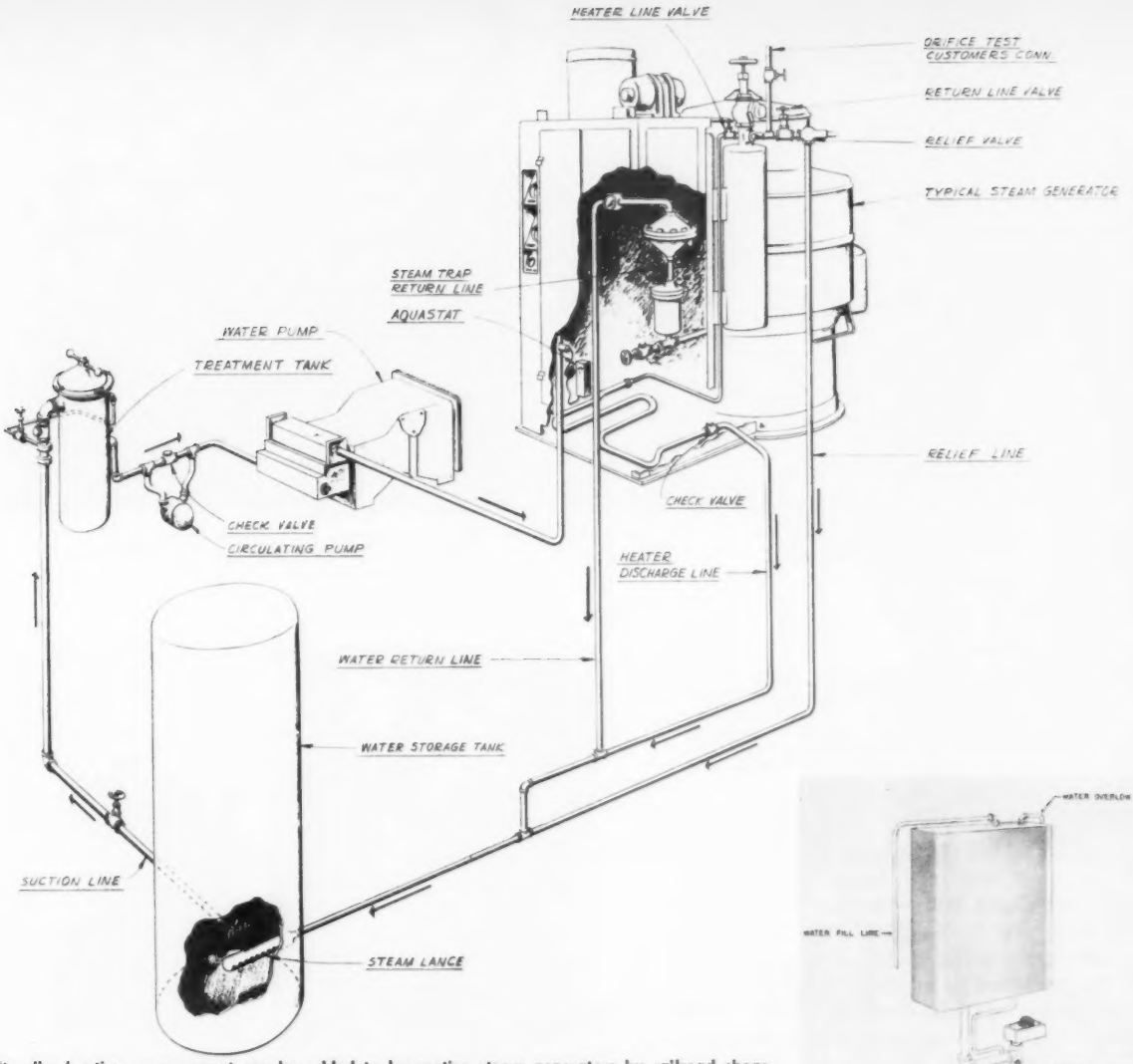
If the unit cannot be stored in a warm building during layover periods, the engine cooling system must be protected against freezing by allowing the engine to idle or employing external heating if the engine is shut down. Steam, electric immersion heaters, or an oil-fired hot-water heater can be used. The engine can idle for prolonged periods without any material effect providing proper engine cooling temperatures can be maintained. In extremely cold weather, the engine may be operated at 350 rpm and 425 rpm to increase cooling water temperatures. The engine consumes almost one quart of fuel oil per cylinder per hour at idle. A cooling system by-pass arrangement on roof shutters are available for switcher and transfer locomotives with continuous operating cooling fans on which it is difficult to maintain proper engine cooling temperatures.

Basically, all EMD units are equipped with a connection so steam can be introduced into the cooling system during engine shut-down. This requires a constant check of the treated water and can be become costly where the only water available requires extensive treatment.

A steam heat exchanger is available which eliminates constant checking of the system for proper water treatment. The engine cooling water is circulated through the exchanger. A motor-driven pump circulates the water through the system. The motor



Oil-fired standby heater application on GP-9 shows water flow paths. This overnight protection can be applied to all EMD units.



Standby heating arrangement can be added to locomotive steam generators by railroad shops.

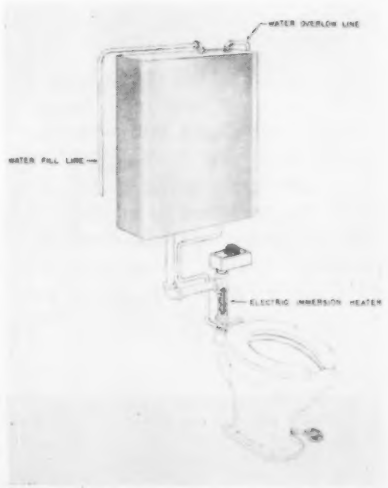
is 1/6 hp, operating on 64 volts d-c with approximately 4 amp current requirement. The heat exchanger capacity is slightly over 100,000 Btu per hour at 100 deg "water-in" temperature. A pressure-reducing valve maintains a uniform steam pressure within the heat exchanger. Steam up to 250 psi can be used. A relief valve is applied as a safety precaution.

Where units operate in outlying districts and no yard steam is available for layover protection, either an oil-fired hot-water heater or an electrical immersion heater can be applied. Both types are fully automatic once the heater is in operation. The oil-fired heater on the GP-9 is connected so that the heater can automatically maintain the engine water temperature with engine in operation or shut down. The heater capacity is approximately 125,000 Btu per hour, and it operates on either 64 volts d-c battery supply or 115 volt a-c supply. Average current requirement is about 7 amp.

An electrical immersion heater connected into the cooling system has a capacity of either 15 kw or 24 kw. It can be connected for either 220 volt or 440 volt current. A pump is used to circulate the water through the system.

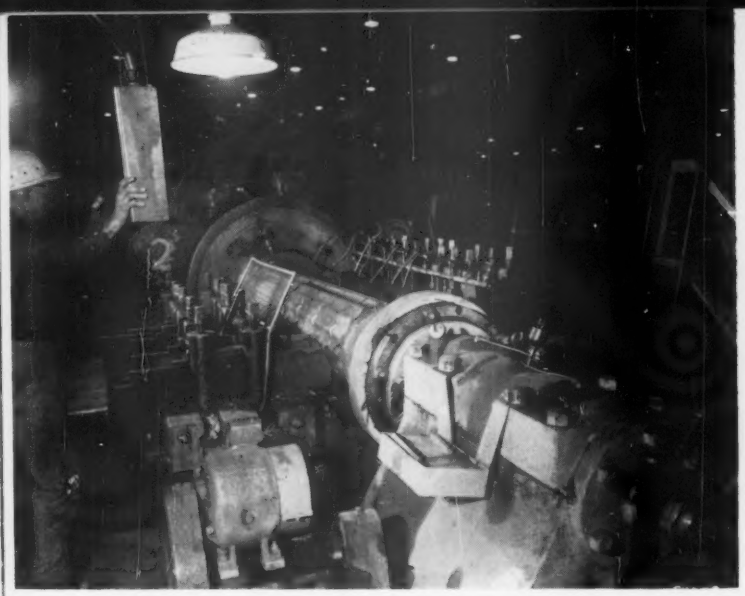
Toilet Tank Protection

Steam, engine cooling water or immersion heaters can be used for protecting the toilet water tank. The latest steam arrangement for heating the tank on units equipped with steam generators is to connect the steam tracer piping in series through a heating coil in the tank. This conserves water and cuts down on excessive spillage from the tank overflow.

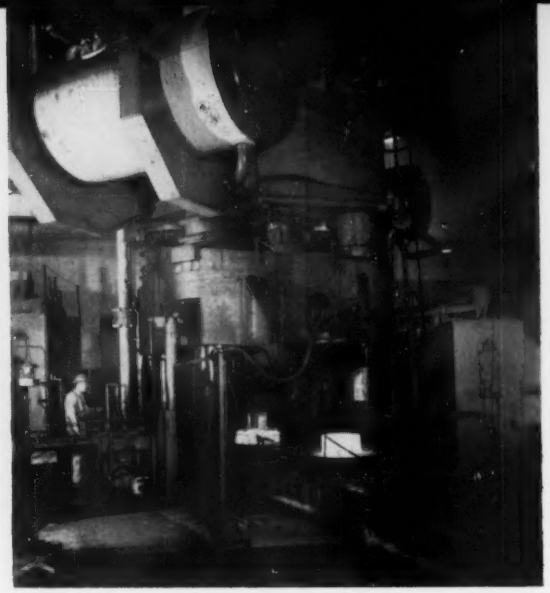


Hopper piping is protected with electric immersion heater which is powered by 74-volt power from auxiliary generator.

On locomotives not equipped with steam generators, the engine cooling water can be used. The hot water flows through the heating coil. With this arrangement, steam can be connected into the system during layover. A small 600 watt electric immersion heater can be installed in the piping below the tank and connected to the auxiliary generator power supply. The heater is thermostatically controlled with the thermostat an integral part of the heater assembly.



Lathes with series of special cutting tools slice long cylindrical ingots into wheel blanks, leaving just enough steel at center to show its condition when fractured by press prior to heating.

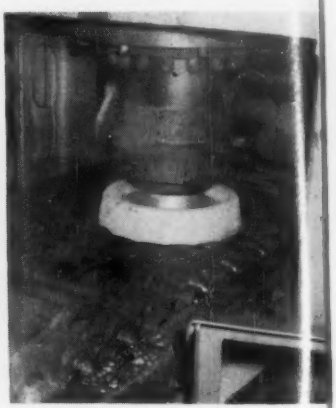


Heated slice waits its turn at forging press. First operation is to press into round slab. Forging dies then automatically move in for subsequent forming.

Armco Revamps Wheel Facilities

AN IMPORTANT part of the $80-million expansion program at the Butler, Pa., plant of Armco Steel Corp. has been replacement of a 50-yr-old wrought-steel-wheel mill with the most modern equipment.

Automatic conveying equipment transfers wheels from one operation to another. Special furnaces with automatic controls were installed to insure consistent quality. Locomotive wheels, heated to 1500 deg F for forging, can be maintained within a range of only plus or minus 10 deg.



Heated slice (left) is about to move into high-pressure water de-scaler on way to forging press. Wheel center is punched out by 800-ton press (right) on conveyor to mill.

Rim, flange and tread are rolled simultaneously (above, right); and then wheel goes to dishing press (above, left). During dishing (right), the wheel is stencilled before going on for heat treating.

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Your "National" Brush Man is an experienced technician whose career is based on a thorough knowledge of brushes and railroad electrical equipment. His analyses and recommendations contribute to your immediate and long range cost reduction programs. Call him next time you have a brush problem. Or write: National Carbon Company, 30 East 42nd St., New York 17, N. Y.

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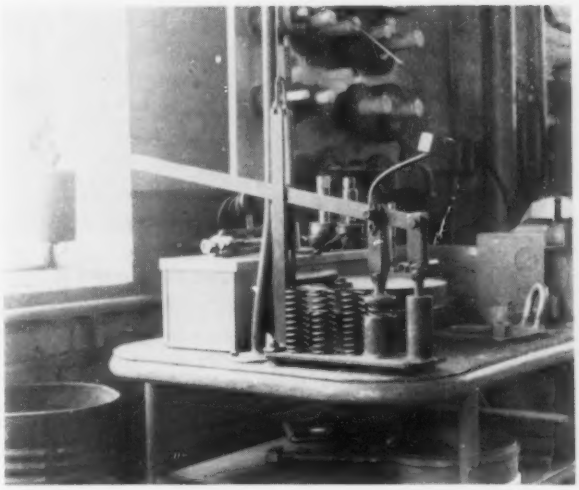
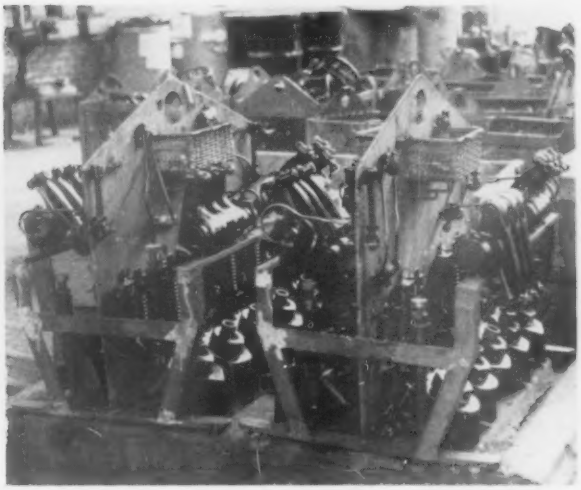
Diesel Repair Time Savers

Valve Spring Tester



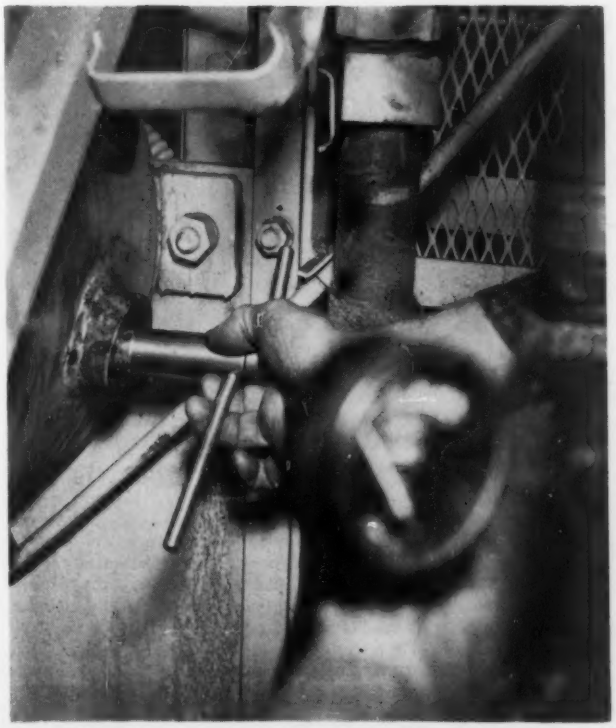
This device is used by the Soo Line at its Shoreham shops, Minneapolis, to test EMD valve springs under load. The spring is placed in a cylindrical sleeve and the weight on the balance arm compresses the spring to the proper loaded height. If the spring is weak, the flat disc on the top of the spring bottoms on the sleeve.

Top Deck Assembly Baskets



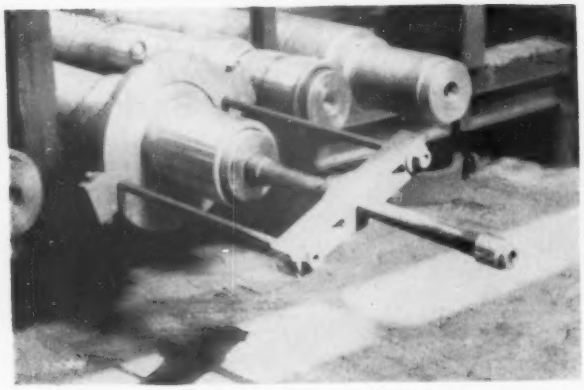
All-welded ¼-in. plate baskets used at the Milwaukee shops of the Milwaukee in stripping and applying top deck assemblies of EMD engines are set in the Vs of engines and, except for injectors, hold four complete assemblies. Removed parts are prearranged in the baskets which are handled by crane to the cleaning vat.

Illinois Central Relief Valve Tool



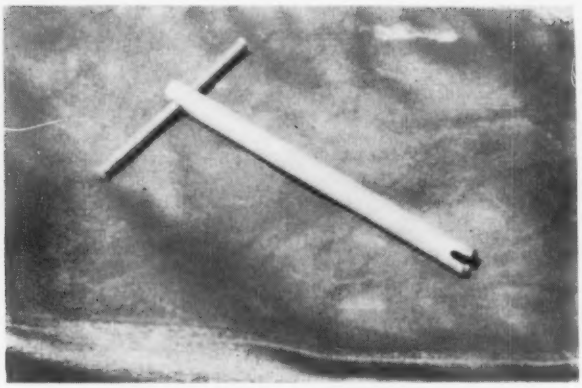
This special tool is used at various points along the Illinois Central system for pulling lube-oil-filter relief valves. It has a tapered section that is drawn with a threaded shank in the main body. The thimble end of the main body, of thinner cross-section, has three slots which permit the thimble to expand, allowing the knurling marks on the outside of thimble to engage the smooth surface of the inside of the valve. The tool is also used in applying the four relief valves in the Michiana lube tank. The valves are 2½-in. below the surface of the hole. Previous method of removal was with a square stick driven into the valve. Removing or replacing the valve header without removing the valves was not satisfactory. The edge of the valve would become damaged if it slipped outward while the head was being removed, or the valves would slip out before the heater could be replaced at the back end of the tank. The valves are now applied after the header is positioned.

Axle Bearing Sleeve Puller



Shop-made puller, used at Paducah, Ky., shop of Illinois Central, removes inner races from diesel axles without damage. Hinged clamp has inner diameter conforming to contour of fillet between body portion of axle and wheel seat with ⅜-in. clearance. Two ⅞-in. pull rods, 26 in. long and on 14-in. centers, connect clamp to crossbar. Acme-thread screw through crossbar bears against push rod on axle center.

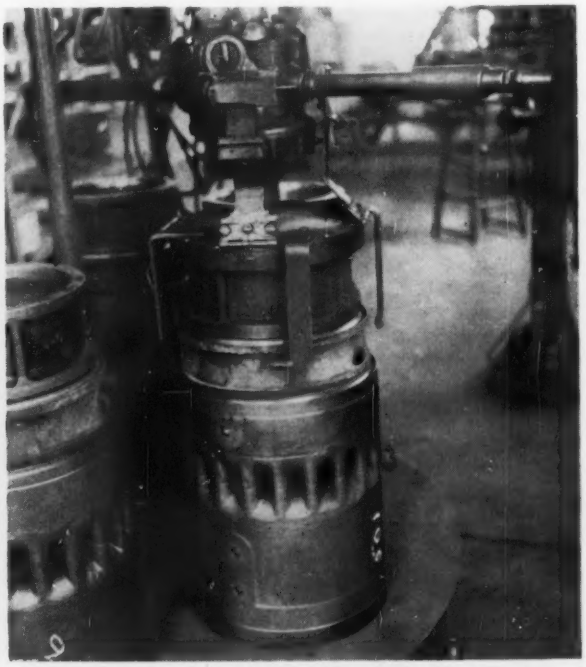
Hose Clamp Tool



The Illinois Central uses this tool at running repair points to facilitate removal and replacement of hose clamps and eliminate leaking radiator hose connections on GP-7 and GP-9 cab heaters. The wrench is made of ⅜-in. galvanized pipe and is 6 in. long. A ⅛-in. slot, 1 in. deep, cut in one end fits over the thumb screw on the heater hose. A ¼-in. rod 4 in. long, is inserted through a hole at the other end for a handle.

Soo Line Cleans Liner Seats

Six liners are placed on the cleaning table simultaneously.



An air motor drives the polishing and honing tools to clean liners.

The Soo Line uses this air-operated device to clean lower liner seats and for honing EMD cylinder liners at its Shoreham shops, Minneapolis. The revolving head has a ¼ in. cover plate driven through a tapered shaft and turns on a brass wear ring placed on top of the liner. The ring and head are oiled to reduce friction. Four hinge arms, designed for easy removal of the device, are fastened to the cover plate and spaced 90 deg apart. Each is equipped with two fitted and shaped bronze blocks made to the contour of the seats. When the arms are positioned, four followers fastened to the cover plate and parallel to the arms help eliminate chattering. Polishing is done with No. 3 emery cloth fastened to the bronze blocks in the top screw. The bottom screw holds a steel scraper on opposite hinge arms. Location is reversed on the other two. A close wound spring fits around the entire assembly and is fastened by a cap screw to one hinge arm. The circular table, which turns on double rollers and holds six liners has a locking device to hold it in a fixed position for honing. The air motor is counterbalanced for easy positioning. Normal cleaning time is about 3 min per liner. The device has made it possible to simplify the reconditioning of the liners.

Hot Air
. . . and High Pressure

By Ken Wright

"Say, that's one with Carrier 66E9 equipment."

It was a hot, sultry day, and Pete had made innumerable trips to the water fountain. It didn't seem to be doing him much good. He was still hot and uncomfortable. As he was returning from the fountain on one of these trips, he passed Big Jim's office and was called in. Jim was perspiring freely as he told Pete rather apologetically, "I sure hate to send you out on this job today, Pete, but we have another mechanical refrigerator car in trouble. They just called from the yard and said that the temperature on this car is going up. We'd better take a look at it."

"Well, I can at least get out in the open and maybe find some breeze," growled Pete. "Where is the car and what's its number?"

After Jim told him, Pete looked up the car number on his tabulated list and remarked, almost enthusiastically, "Say, that's one with Carrier 66E9 equipment. That means that it has a single compressor. I sure have been wanting to see one of these cars."

Pete started toward the yard in a little better frame of mind. He forgets to complain when he is doing a trouble shooting job. When he arrived at the car, he found the engine and condenser fan running. From the appearance of the oil in the compressor sight glass, the compressor was not running.

He checked the compressor overload resets and then the compressor fuses. The compressor contactor would not pick up and start the compressor. As he was looking at the wiring diagram mounted in the panel, the compressor contactor closed and the compressor started. It only ran for a few minutes and again stopped.

Pete then checked the temperature of the piping and found that on the discharge side it was exceptionally hot. This would give some idea of the head pressure. Feeling the piping, of course, is no definite check but it did give Pete an idea about where to start. He knew that excessively high discharge pressures would cause such hot piping.

With a discharge pressure as high as 250 psi, the dual refrigeration pressure switch (*high-low* switch) would open the circuit to the compressor contactor. This dual refrigeration pressure switch protects against high pressure on the discharge side and against extremely low pressures on the suction side. Therefore, the cycling of the compressor on the car must be due entirely to the action of its dual refrigeration switch.

High discharge or head pressures are caused by: (1) Restriction or blocking of the air passages through the air -cooled condenser by trash or dirt; (2) condenser fan not operating; (3) overcharge of refrigerant; or (4) presence of air or other non-condensable gas in the system.

Pete checked the condenser. "Sure wish I had the test gages here so I could tell where I was," he said to himself. The condenser was not completely clean but the small amount of dirt in it was not enough to cause trouble. Pete decided that he at least would check other things and could come back to the condenser, if nothing else was found. He then made sure that the condenser fan was running although he had checked that when he first arrived at the car. Air certainly was passing through the condenser.

Pete then looked at the liquid receiver sight glass for an overcharge of refrigerant. The sight glass was not full, so no overcharge could be causing this trouble. That left as a source of the trouble the possibility that there was air or non-condensable gas in the system.

Pete, knowing that some time would be required to purge the system of any air, went to the phone, called Jim, and told him that the car had better be set out until the trouble could be corrected. Pete went back to the car before returning to the shop, and checked the log book. He found a notation at the last terminal inspection indicating that a leak had been repaired. The log book was not specific as to where the leak had been; but Pete assumed that it could have been on the suction side where it would draw in air.

When Pete got back to the shop, he began to pick up tools he would need. Jim came up and asked him what he meant by "air in the system." "If there is air in the system," Jim asked, won't there be moisture there too? And wouldn't that cause a freeze-up?"

"That's true, Jim," Pete agreed, "and I don't know for sure that there isn't moisture in the system. I want to try and get the air out first. Then I will find out how much moisture there is. If there is too much, then we'll probably have to transfer the load to another car so we can apply the vacuum pump to the system and evacuate the moisture."

"How can you tell if there is too much moisture?" asked Jim.

"This system has a Dry-Eye moisture indicator. It is a sight glass with an indicating disc of a sensitive material. If the disc is a bright blue color, there are less than 10 parts of moisture per million. If the disc is a light blue, the moisture content is between 10 and 20 parts per million. If the color is a pink to brown color, then there are more than 30 parts per million."

"Well, what color should it be?" Jim asked.

"It must be a blue color, and preferably a bright blue. If it isn't a bright blue, I'll change the dryer cartridge. That won't take all of the moisture out of the system, but will lower it. It is the only choice that we have. It isn't

(Continued on page 48)

This is the eleventh article in this series, discussing the operation, maintenance and trouble shooting of mechanical refrigerator cars.

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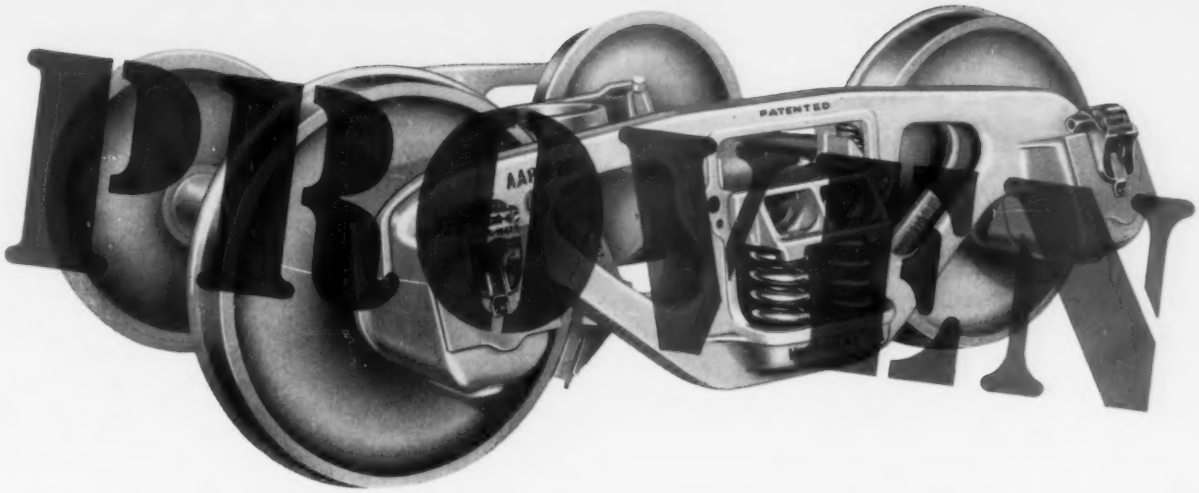

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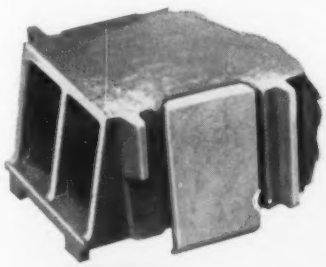

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(Continued from page 45)
practical to transfer that load here."

The car had hardly arrived at the shop until a fellow came up and said, "Jim said I should help you, Pete."

"Fine, Spike, it might turn out to be very helpful to you."

The two applied the test gages to the system. The indication on the high pressure gage built up to 250 psi when the compressor cycled on and stopped when the pressure actually reached 250. When the pressure dropped to 190 psi, the compressor again would cycle on. Pete told Spike that discharge pressure is normally related to the temperature of the surrounding air. The compressor must build the pressure high enough in the condenser so that the air passing through the refrigerant gas can condense. The higher the temperature of the air passing through the condenser, the higher the head or condenser pressure must be.

Inversely, the lower the ambient temperature, the lower the condenser pressure need be. It is a law of gasses and liquids that condensing and evaporating temperatures are the same. By referring to printed tables, if a temperature is known, the pressure can be found. The inverse is also true.

Pete pointed out to Spike that the thermometer on the shop building read 92 deg F. Pete's table for Freon 12 showed that at 92 deg F, the pressure should be 103 psi *(Other relations were shown on p 28 of the September 1959 issue—Editor).*

"Now, Spike," said Pete, "remember that there is some resistance in the lines. Also, heat transfer is not 100 per cent efficient in a condenser. Even so, you can still see that 250 psi pressure in the discharge line is much higher than the 103 psi which should be necessary to condense the Freon.

"If there is air or some other gas in the system which will not condense, the compressor will continue to raise the pressure. For all practical purpose, air cannot be condensed. The 250 psi is well above normal pressure and the system must be shut down.

"To determine for sure that it is air that is causing the trouble," Pete continued, "we will shut everything down. After the parts have reached normal temperatures, the discharge pipes have cooled to the outside air temperature and the suction lines have warmed up to it, then we will read the pressure. If the pressure reads more than 113 psi, it will tell us that the system has air in it. The chart showed that the pressure at 92 deg F should be 103 psi. If the gage reads more than 10 psi above this, it indicates that there is air."

"How do we get rid of the air, if that's our trouble?" asked Spike.

"That depends on the system," said Pete. "Generally you would want to purge air from the highest point. Sometimes that is not possible. Notice that at the top of the receiver on this Carrier unit is a small capped valve. That's a purge valve. When the pressure and temperature become normal, we will open that valve slightly and let the air escape. We must be careful and not let much refrigerant escape, or we would then have to recharge.

"To go further with your question, if no regular purge valve is provided, then other means would have to be used. For instance, the discharge shut-off valve at the compressor can be used by utilizing the front-seat port. You may have to go through the procedure several times to get all the air."

It did not take too long for all parts of the system to warm or cool to normal temperature. When they checked the pressure, it read well in excess of 113 psi. They then purged the air as Pete had said they would. To be sure that they had all of the air, Pete started the unit, let it run for a few minutes, and then shut it down again.

After some minutes, they checked the pressure again. They found that it was necessary to purge a second time.

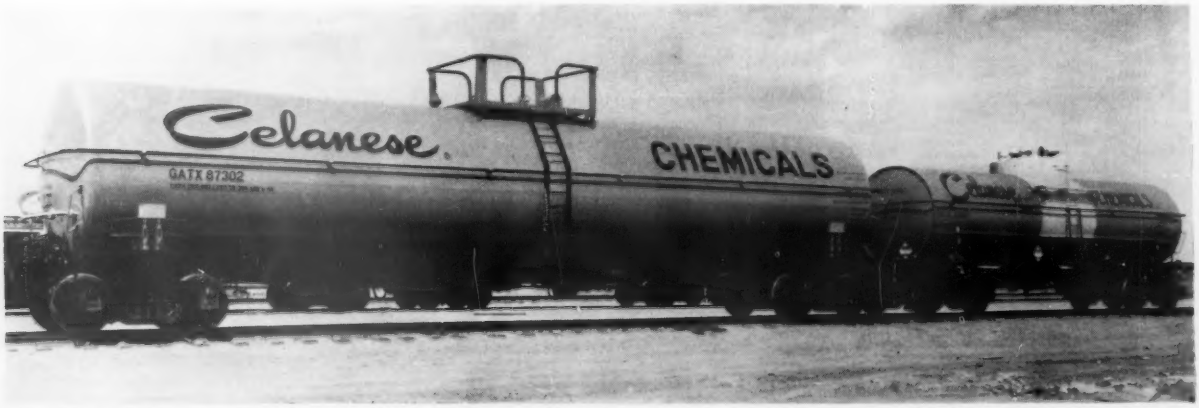
Big Jim, the boss, walked up about this time and asked Pete about the moisture indicator, so all three men checked it. It is located in the fitting to which the dryer cartridge is attached. The Dry-Eye disc showed a very pale blue, indicating that 20 or more parts per million moisture were present.

"Jim," Pete said, "I am going to change this dryer cartridge. It won't take all of that moisture out but it will allow this car and its load to go on through."

Pete showed Spike how to pump the system down and isolate that portion which contains the dryer so its cartridge could be changed.

"Spike," said Pete, "what we've done here isn't the real lesson to be learned. When a leak occurs, there is more to do than merely stopping it. If the fellows that repaired the leak on this unit had checked after they finished, they could have found that air had been drawn into the system. They should also have checked the Freon and oil in the compressor. Don't add Freon without checking the oil. When Freon is lost, oil is also lost."

They started the equipment and watched it for a few minutes. The car's temperature started down and they released the car so it could continue its trip.



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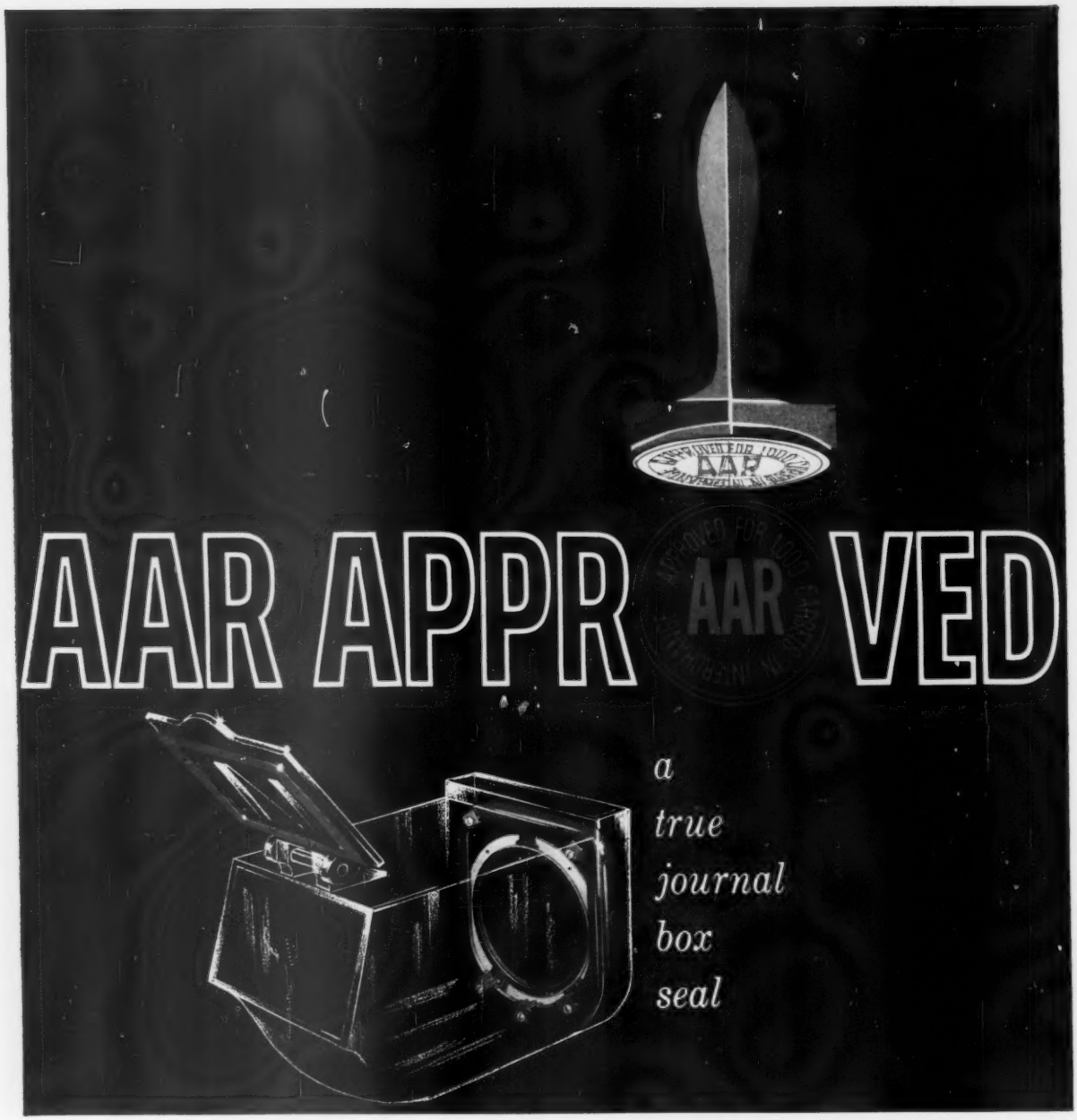

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From This . . .

. . . To This

Production Line Armature Assembly

Good workmanship and high production result from method developed at Rock Island's Silvis shop

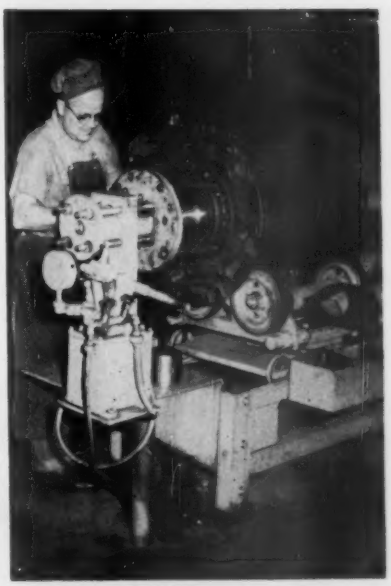
A stand for reassembling roller bearings and housings on overhauled traction motors, developed in the Silvis, Ill., shop of the Rock Island, makes the work faster, safer and easier. It is an ingenious arrangement based on long experience. All work is done at a convenient working height with the armatures in a horizontal position.

The stand consists of an elevated track on which are five carriages on small grooved wheels. On each carriage there is a turntable, supporting four rubber-tired wheels which serve as rests for an armature. The armatures may be rotated on these wheels. Each of the turntables may be rotated horizontally through 360 deg, and pinned or locked in any one of four positions. The illustrations show the armatures close together, but because the carriages may be rolled on the horizontal track, the spacing may be increased to permit rotation. There is a parts box mounted on the side of each carriage.

At one end of the stand is a 50-ton jack for removing bearings and end housings. The commutators of some of the armatures are seasoned in the process of overhaul. This is done on seasoning bearings so that the service bearings are not subjected to the heat of the seasoning process. The jack is used for pulling these bearings.

The jack is equipped with a hand-operated pump. By manipulating three valves, the pump serves to raise the jack to the height required, and also to force a ram against the shaft to pull the bearings or housings.

An electric oven back of the operator is used to heat bearings and housings before applying them to armatures. Four pinion-end housings are placed in the oven at the end of a working period and a timeswitch starts the oven two hours before the begin-



Puller is applied after armature has been rotated 90-deg on turntable mounted on one of the rubber-tired carriages.

Handle of hand-operated pump is at convenient height for man removing bearings or housings. Jack height can be adjusted by the operator.

Oven with cover lifted shows housings being heated for application. Oven is across aisle from production line and is easily reached.

ning of the work shift. This assures their being at the proper temperature when they are needed.

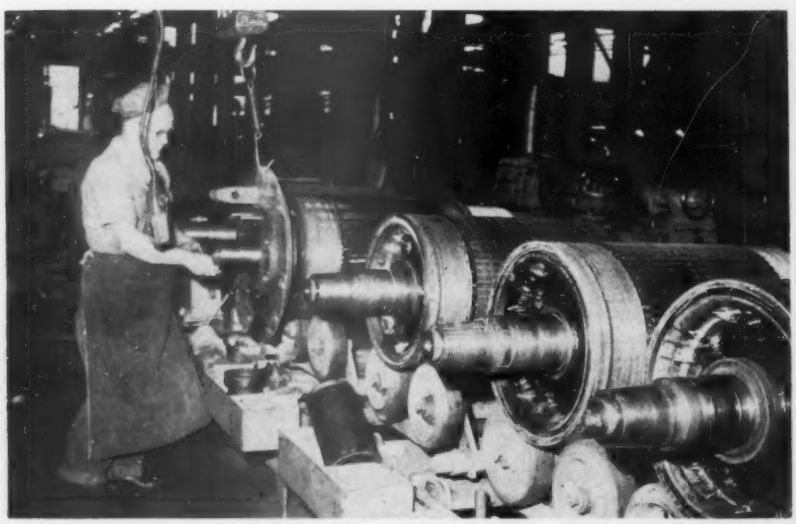
At the start of a shift, four armatures are placed on the stand with a sling. Housings are removed from the oven one at a time and the outer races of bearings are applied in the housings. The housings are then allowed to cool until they are to be applied to the armature.

The shafts are cleaned and shoulders checked for burrs or imperfections. The proper amount of grease is applied to the back bearing cover, and the cover mounted on the pinion-end of the armatures. The pinion-end flingers are next heated and applied to the armature shaft.

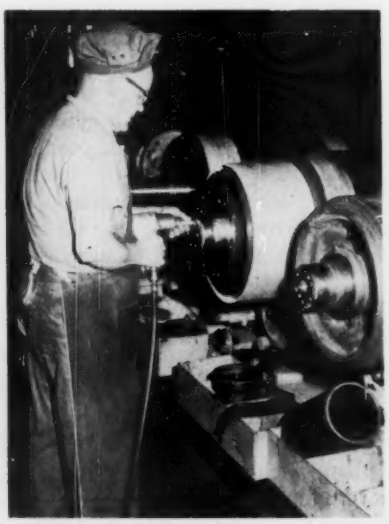
Guide studs are then applied to the inside bearing cap. The pinion-end housing is lifted by a spring hook, and positioned over the guide studs, and slipped over the inner race into position. Grease is then applied to the outer bearing cap. Gaskets are applied and the assembly bolted together.

The four armatures are then rotated 180 deg on the turntables, and the procedure repeated for the commutator end. The distance between the pairs of rubber-tired, supporting wheels is adjustable from 9 in. to 20 in. to accommodate various lengths of armatures. All work may be done in the aisle between the work stand on one side and the heating oven and bench on the other.

The new stand replaced the original set-up shown in one of the illustrations. With this method the armatures were moved to the area in a vertical position, and placed with the commutator end on wood blocks. This made it necessary to turn armatures to work on each end, and also to place it in a horizontal position close to the floor in an inconvenient working position.



All work is done at convenient height. Spring hook suspended from overhead jib crane assists in the application of end housings to the rebuilt armatures at completion of process.



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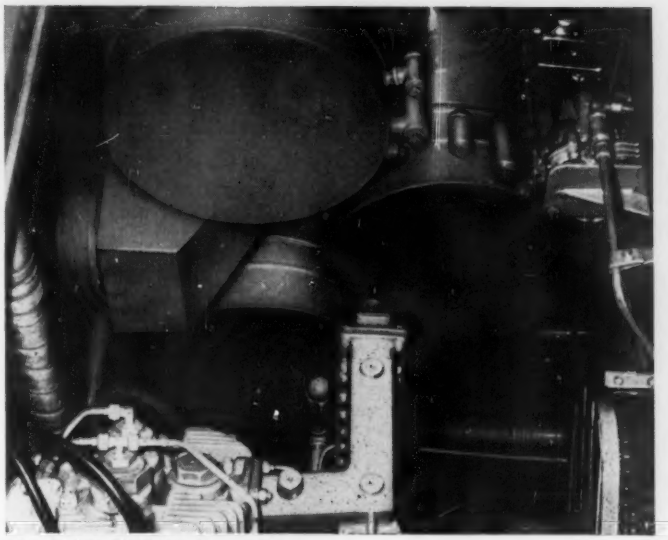

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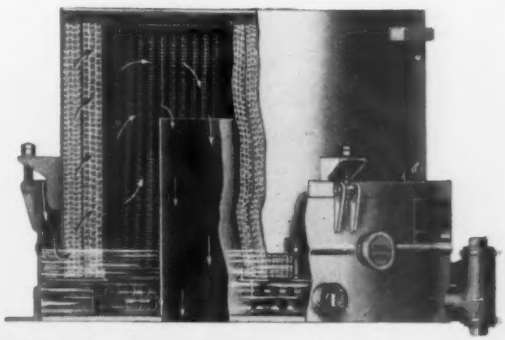

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EMD Electro-Magnetic Switch Gear

Part 2

This is the second of two articles on electro-magnetic switch gear prepared by Electro-Motive Division. The first appeared in September 1959.

A schematic diagram of the power device control and interlocking elements is shown in Fig. 3. Notice that there are directional relays and reversing interlocks supplying all of the power contactor coils. Interlocks of appropriate BKP and BKB contactors are also in the power contactor coil circuits. Rectifier type arc suppression rectifiers are on each two-pole, double-throw reversing contactors. The combination of a very fast drop-out of the power contactors, and retarded drop-out of the reversers is such that the power contactor clears the motor circuit before the normally closed reverser contacts can "plug" the motor. In addition to this anti-plugging feature, the control circuits are arranged so that a stuttering or in-

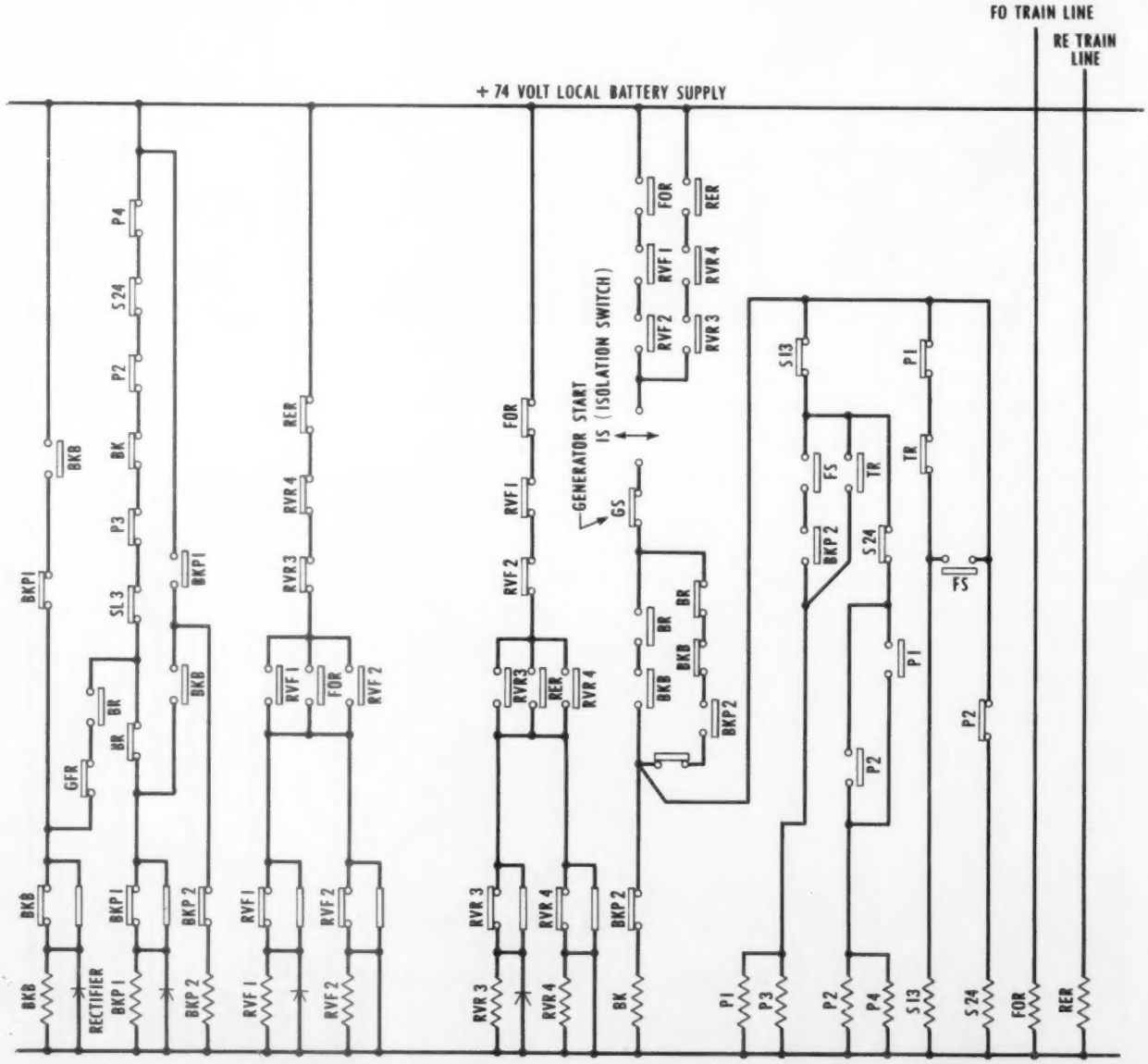


Fig. 3—Control circuits for typical road switcher of GP-9 type include provision for continuously energizing reversing contactors. There are directional relays and reversing interlocks supplying all the power contactor coils. In this diagram, the BKB interlock at upper left should normally be closed, and there can be a P3 interlock, normally closed, between TR and P1 at the upper right.

termittent trainline circuit will not deenergize the reversing contactors, but it will affect the power contactors. To make these units respond like units having pneumatically operated reversers, the trainline opposite to the one controlling must be energized to change the direction selection.

There are other ways of connecting the motor field circuits to accomplish direction selection. In the description above, the term "plug" was used. This is a connection which makes the motor a series-excited generator. When this occurs, the motor and generator voltages are added, and loaded on the resistance of the cables connecting them together. The possibility of "plugging" as a result of circuit or device failure can be avoided by connecting the two-pole double-throw devices differently, as in Fig. 4. This requires an even number of motor circuits, and one device per motor circuit. One of the two-pole double-throw devices FO1 is now energized for forward motion, and only the other device—RE1—must be energized for reverse motion. Failure of a reverser to respond to the control circuit with this arrangement simply opens the circuit to the motors.

Locomotives having only one motor connection are designed with a circuit so that power contactors can be eliminated. Single-pole, double-throw devices with considerable interrupting capacity on the normally open contacts are used rather than two-pole, double-throw devices. Such a power circuit is represented by Fig. 5.

Isolating Motors

There are some locomotive applications where it is desirable to either completely isolate a motor, or take the power off a motor circuit. This provision to permit isolating a motor is one reason for choosing one two-pole, double-throw contactor to handle the reversing function of the GP-9 motors. A mechanical latch provides the isolating function, since it holds the reversing contactor in a neutral position. An interlocking switch operated by the mechanical latch sets up auxiliary control circuits used to connect the remaining motors to the generator and provide protection for the generator against overloading. The motor isolation feature for pneumatically operated reversers is also accomplished by a mechanical lever which lifts up the main reverser contacts and operates an interlocking switch to set up proper control circuits.

The principal difference between the performance of magnetically and pneumatically operated power contactors is in operating time, particularly opening time. Magnetically operated contactors drop out much faster than air operated. For this reason, pneumatic contactors should not be used with magnetically operated reversing and braking contactors without basic control circuit changes on the locomotive.

Servicing Requirements

For shopmen who service the electrical system, there are comparatively few differences between pneumatic and magnetic control power. Practically all checking for sequence can be done with the engine shut down and no control air. All checks for air leaks are eliminated. Techniques of trouble shooting are essentially unchanged. The magnetic control system has a few more interlocking circuits. The devices are smaller and weigh much less. It is convenient to replace a defective one and repair the defect on a bench rather than thy to do it at the control cabinet. Main contacts of the power contactors subject to damage due to accidental mishandling or other influences beyond the scope of design are very accessible. These contacts are silver alloys, and should not be cleaned or filed because of appearance.

Electro-magnetic switchgear is now basic on all EMD domestic and export models.

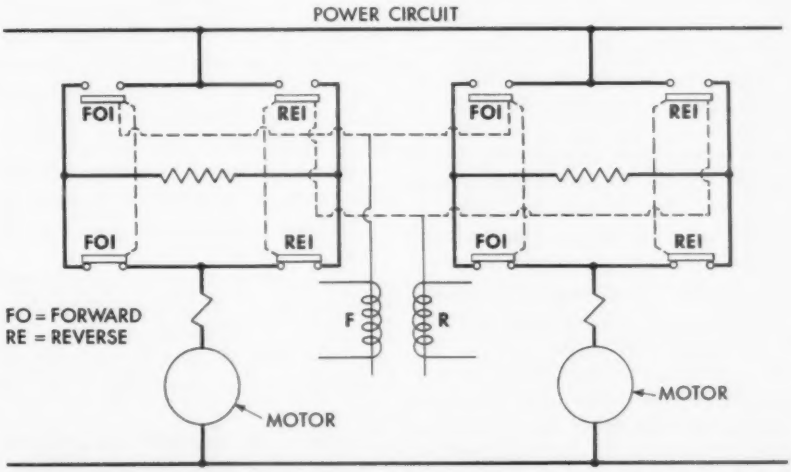


Fig. 4—Protection against the "plugging" of motors, resulting from circuit or coil failure, is prevented by connecting the two-pole, double-throw devices as shown. It requires an even number of motor circuits and one of these electro-magnetic devices per circuit.

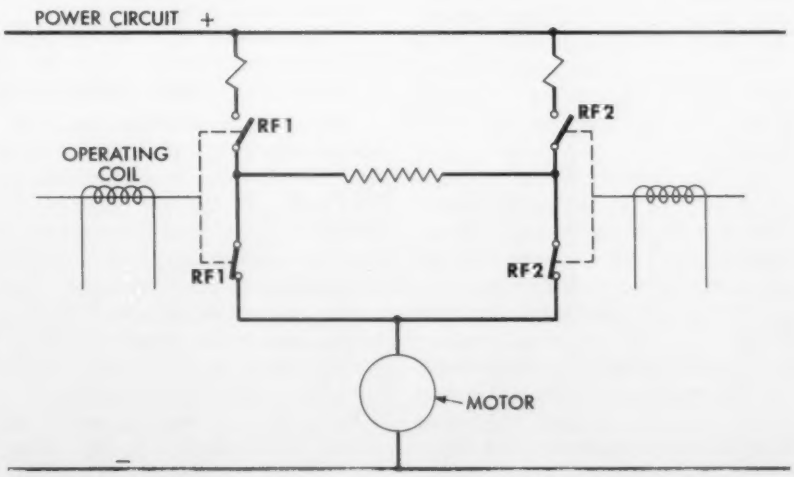


Fig. 5—Elimination of power contactors is possible on locomotives with only a single motor connection. Here, single-pole double-throw devices are used rather than the two-pole, double-throw devices used where there is more than one connection.

Carbon Brush Operating Properties

Characteristics of brushes vary; good performance of motors and generators depends on proper choice

By M. S. May

The satisfactory performance of any brush-equipped electrical machine—especially one that must meet the severe requirements of railway service—depends upon the selection of the proper brush grade. Brush properties should be suited to the type of machine, the service to be performed, and the conditions under which the machine will operate. Various properties of carbon brushes affect their performance on d-c electrical machines.

The first is contact resistance or contact drop. This may be defined as resistance to flow of current between the brush and the commutator or slip ring. Carbon offers a higher contact resistance than do metals. By minimizing the current in the short-circuited coil of the d-c motor or generator, sparking is reduced. A brush that is too low in contact drop tends to permit burning of the commutator resulting in a boost in maintenance costs.

A second desirable property is low coefficient of friction which enables a carbon brush to run on a commutator for long periods with a minimum of commutator and brush wear and a minimum of power loss. Linear speeds of certain traction motor commutators may be nearly two miles per minute. Minimum friction is also important in that it tends to reduce high-frequency vibration, which can be destructive both to the brush shunts and to the brush itself.

Another property is conductivity or the brush's ability to carry current. The need for this is obvious when we consider the high loads that railway electrical equipment and brushes carry, particularly when trains are being started.

A fourth property is abrasiveness. Abrasiveness or polishing action may be defined as the ability of the brush to keep the commutator clear of objectionable coatings. It is, perhaps, the opposite of so-called filming action.

In addition to these four properties that contribute most to brush operation, other properties frequently mentioned are specific resistance, apparent density, hardness, breaking strength, carrying capacity, and maximum operating speed.

Contact Resistance

Contact resistance (or contact drop) is mentioned first because it is probably the most important property that distinguishes carbon from other materials. It is the resistance to current flow between the brush face and the commutator surface or at any carbon-to-metal contact. Expressed in ohms or voltage drop, it can be illustrated in many ways.

For example a stack of 25 carbon-graphite grade discs is compressed at 4.5 psi pressure, and its resistance tested. Metal vanes are applied between adjacent discs and the resistance again tested.

Results are calculated to indicate the resistance per contact as follows:

Carbon discs only	0.001 ohms
Carbon discs with copper vanes	0.003 ohms
Carbon discs with iron vanes	0.0491 ohms
Carbon discs with cleaned iron vanes	0.0088 ohms

Since a pile of metal discs would obviously represent a short circuit, it is apparent that the contact resistance from carbon to ordinary (slightly oxidized) copper or iron is much higher than that between two pieces of carbon or between two pieces of metal. The carbon pile in this example is similar to that used in the control of passenger-car generators which supply power for lighting and air conditioning.

Running tests may be made on dummy commutators or slip rings. The brushes are mounted in conventional holders and run against solid rings or rings that have been slotted to simulate a commutator. Current is passed through and the voltage drop between each brush and the commutator is recorded. The U.S. Navy uses such a test before approving brush grades and brush manufacturers use it for developing improved grades.

Black band tests do not directly measure contact drop but do effectively compare the commutating ability of brush grades. This test is run on a motor or generator having interpoles and consists in boosting or bucking the interpole current to vary the interpole strength while observing the amount of sparking that occurs at the brush contacts. The buck or boost points at which sparking appears and disappears at various loads are plotted to form a curve.

The major manufacturers of diesel motors and generators often use black band tests both to check the design and construction of their equipment and to evaluate brush grade performance. There are many ways to measure contact drop but, unfortunately, none duplicates actual operating conditions. The disc-stack method lacks motion and commutation; the slip ring method lacks commutation; while the black band method is comparative rather than numerical. As with all "laboratory" tests, the data are true only under the test conditions.

There are many other factors that influence contact drop even though they are not part of the brush or its mating surface. For example, contaminants in the air, such as acid vapors, moisture, abrasive dusts, oily vapors, or oxygen starvation deteriorates commutator film and adversely affects contact drop. Even a puff of smoke blown on the commutator has been known to influence contact drop during laboratory tests.

Machine vibration caused by worn bearings, weak foundations, bent shaft, out-of-round commutator, etc. affects contact drop. Thus it is apparent that even precise laboratory figures are not directly applicable to machines oper-

Mr. May is Manager of the Customer Technical Services Dept., Carbon Products Division, Speer Carbon Company.

ating under non-laboratory conditions. It is also apparent that precise laboratory results are extremely difficult to obtain, while results from one laboratory may differ widely from those obtained in another.

Coefficient of Friction

Coefficient of friction is defined as the ratio of the force on a surface to the force required to slide another surface over it. In the case of a brush, the coefficient of friction becomes the ratio of the force of the brush against the side of the brush holder and the force of the brush against the commutator. Since brush friction serves no useful purpose, the power required to overcome it is wasted. Low-friction brushes are preferred.

Coefficient of friction can be determined on a test stand, using either a slotted or unslotted slip ring, concurrent with the running contact drop test. This is done by mounting the brush holders on a device that will measure their tendency to rotate with the ring because of brush friction "pull." The results, however, will not be consistent with those under service conditions because of other factors, discussed under "Contact Drop."

Conductivity is of importance because the primary purpose of a brush is to carry current. For some reason the industry has chosen to measure the inverse of conductivity-resistivity. The resistance, in ohms, of a piece of brush material that is 1 in. by 1 in. by 1 in. is calculated. The number of ohms between opposite faces of the one-inch cube is the resistivity or specific resistance. The figure for electro-graphitic brush grades generally is between 0.0004 and 0.0025 ohms; that of carbon graphite grades between 0.0008 and 0.0030 ohms; coke-bonded graphite grades between 0.0004 and 0.0012 ohms; resin-bonded graphite between 0.0009 and 0.100 ohms; and that of metal graphite grades between 0.000002 and 0.0003 ohms.

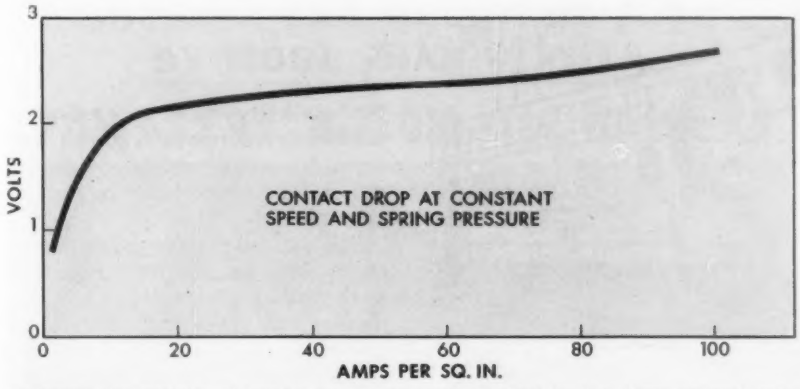
The internal resistance of a brush doubtless has some effect on its operation, but it is a minor factor when compared with the contact resistance. One grade, for example, may have a specific resistance of 0.0015 ohms, with a contact drop of 2.1 volts at 60 amps. Assuming a brush made of this grade to be 2 in. by 1 in. by 1 in., the internal resistance will be 2 times 0.0015 which equals 0.003 ohms. Obviously the internal resistance is only .01 as much as the contact resistance.

Abrasiveness is not measured directly. By definition, it is the tendency of the brush to mechanically polish or abrade the commutator surface, and is evaluated by the ash content, the hardness, the composition of the brush material and method of processing it. Due to the trend toward higher commutator speeds, the need for abrasive brushes has lessened materially; they are used only in particular cases to remedy an unusually severe operating condition, such as heavy air contamination by sulfurous gases. Most electro-graphitic grades are very low in abrasiveness, with an ash content of 0.15 per cent or less.

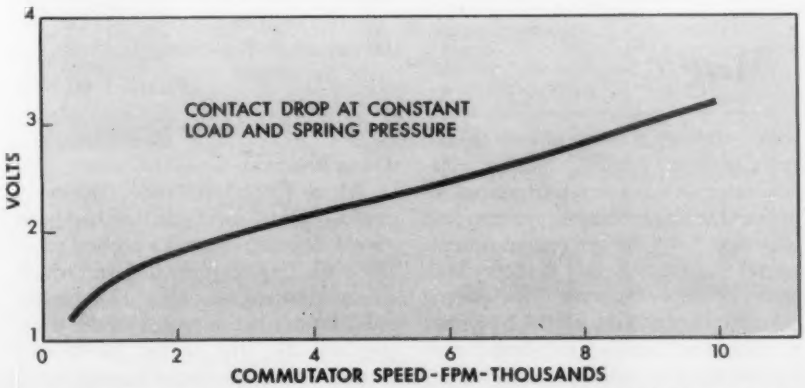
Another figure frequently given in brush catalogs and considered to be a brush property is carrying capacity, specified as x-ampere per sq. in. It is assumed to be the maximum current a brush can conduct. Like so many brush properties, it is not an exact figure and is, at best, the safe load under normal conditions of machine design and operating conditions.

Actually the load that a brush can carry is a function of the heat, dissipation properties inherent in the design of the machine, the brush itself, and the brush holders. If the brushes and commutator are kept cool, the amount of current that can be carried is usually limited only by the capacity of the shunts. Generally speaking, more trouble results from underloading brushes than by overloading. Excessively light loads in brushes tend to cause high friction and resulting vibration; case histories show that vibration, from this cause, can become severe enough to destroy the brush and its shunts.

The maximum permissible commutator surface speed often listed is likewise, subject to differences of opinion. This is so because its limitations are determined by many factors, such as machine design and operation condition, brush friction, contact resistance, hardness or resiliency, and mechanical design of the brush. Because the purpose of the brush is to conduct current between stationary and rotating elements of an electrical machine, it is important that the brush maintain continuous contact with the commutator. The difficulty of attaining this condition is apparent when it is remembered



Resistance characteristics of brushes are among results required for U.S. Navy approval tests.



Results of running tests on dummy commutators are used in course of brush development work.

that the commutator surface is moving at a linear speed of from one to two miles per minute.

Even the "perfect" commutator is slightly eccentric, and is not a continuous surface but rather intermittent because of its bar-and-slot construction. Under these adverse physical conditions the brush also must commutate well enough to prevent excessive sparking. Reactance voltage of an electrical machine being a function of its speed, contact drop becomes increasingly important as rotating speed increases. In the final analysis, the maximum speed at which the brush delivers peak performance most often is determined by experience, tempered by other factors, some of which can be measured, others only estimated.

These are the principal brush properties that are important to the operation of the machine. There are, however, other important properties that are measured regularly to control uniformity in manufacture of the brush material. The most important of these properties are: apparent density, hardness, and breaking strength.

Apparent density is the weight of a material as compared with the weight of an equal volume of water. Thus, if a cubic centimeter of brush material weighs 1.6 grams, its apparent density is 1.6, since one cubic centimeter of water weighs one gram.

Hardness may be measured in several ways—scleroscope, monotron, or Brinell, being the most commonly used machines. The scleroscope measures hardness by dropping a "hammer" on the sample and measuring the height of its rebound. Monotron and Brinnel both measure the ratio between the pressure applied to a hardened ball and the penetration of the ball into the surface of the sample.

The "hammer" and the "penetration" types of machines measure different properties though they are all referred to as "hardness". Because of the physical structure of carbon, the hardness test figures are erratic as compared to similar tests on metals. Test results have limited accuracy and are useful for comparison only.

Breaking strength is measured by supporting a sample on two knife edges and applying pressure to a third knife edge located midway between the supports. The sample thus is broken transversely and the result is referred to as "transverse breaking strength". The term should not be confused with tensile strength or crushing strength.

No attempt has been made to discuss, or even list, every property of a motor or generator brush that influences its satisfactory operation as a current conduction in an electrical machine. The most frequently encountered factors have been catalogued in the hope that better understanding will help solve brush operating difficulties.

From the Diesel Maintainer's Note Book

Muddled Magic?

The episode, "More than Magic to Keep This Diesel Running," in our August issue, has resulted in the following letters between one of our readers and author Gordon Taylor.

DEAR MR. TAYLOR:

Your article, "More than Magic to Keep This Diesel Running," on page 60 of the August issue indicates that three engines in two separate E-8 passenger units shut down after a ground relay tripped. Actually, each engine-generator set has a separate ground relay, and a single relay tripping would only shut down the one engine-generator set involved. Either the story is in error, or there was some other electrical difficulty to cause all three engines to shut down, as it is virtually impossible for three ground relays to trip simultaneously. The explanation as to the reason the engine stopped when the throttle was opened is correct, but, again, this only affects the one engine-generator set on which the ground relay trips.

The railroad practice of shutting an engine down to check engine-lube-oil level aroused my curiosity since engine-lube-oil level can readily be checked on E-8 locomotives with the engine running. I do not believe that the shutting down of an engine to check oil level is a common practice on units such as the E-8 and other locomotives built in recent years.

Puzzled Reader

DEAR READER:

When I received your inquiry, I realized that a good question had been raised, because there is a ground relay for each engine-generator set which affects that engine only. The ground relay on the No. 1 engine of the trailing unit did trip as the locomotive passed over the railroad crossing and, in throttle 5 position, this engine shut

down. This left power working on the front unit only. The engineman thought that a ground relay was involved in the reduction of power, but he became confused and inadvertently pushed the throttle on the control unit to "Stop" position, which shut down all engines.

All he needed to have done was to reset the ground relay on the faulty unit, which could have been done without shutting down all engines (I now share his confusion by failing to detect this error in the original report).

The fireman started the engines on the lead unit, but when he went to the rear unit, he found that its weak battery made it impossible to crank the No. 1 engine. That meant that the trailing unit was now completely dead. The only choice was to isolate the rear unit and haul the train with lead unit at reduced speed until a relief unit could be secured.

The balance of the original story is correct, except the comment in next to last paragraph which states: "Things would have been much worse had the ground relay action been caused by the lead unit, then both units would have been rendered helpless." It would have been more accurate to say: "Had the ground relay action occurred on the lead unit, and if the ground relay action persisted, then one engine on that unit would have been put out of business."

Now as to the practice of shutting down an engine to check lube oil level and replenish supply. It is a fact that the road in question follows a practice of shutting the engines down momentarily at this servicing point. While the engine-lube-oil level can be checked with engine running, the removal of dip gage results in oil flooding out of the gage hole. The stop at this terminal affords the only opportunity in a long-distance operation for a quick check of engine and air-compressor-oil levels. The practice of a momentary shut-down of engines is followed.

I am sorry I failed to detect an obvious error in the original report. I wish to thank the reader who detected this error. His action helps in making Diesel Notes a reliable source of information.

Gordon Taylor

CUT BOX CAR RELINING TIME BY MORE THAN 2/3 WITH

POWASERT® AUTOMATIC NAILERS

Powasert Nailer drives approximately 500 8-penny nails in floor at rate of 30-40 per minute.

With Powasert Automatic Nailers one man can completely reline a car in less than ⅓ the time. With a hammer, a relining job on *one* car takes 8 hours. With Powasert, one man can reline 3½ cars in 8 hours.

Powasert Nailers drive from 30 to 40 8-penny nails a minute. Nails are easily loaded into the feeder-separator unit and fed automatically to the gun. Gun works merely by pressing nose against work and squeezing trigger. Handles nails from 1″ to 4″.

Powasert Automatic Nailers can help you cut your nailing costs, increase production, and reduce operator fatigue. Get rolling stock out of shop and back into service faster. Write or call us today for a demonstration.

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Liberty 2-9100

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We need three more good men to serve our most important customers—the growing American Railroads. These men will work out of New York, Chicago, and Los Angeles.

They will sell the expanding line of new products—as well as air filtration equipment that has become the standard of the American Railroad.

They must have good sales records—5 years in the railway supply field, preferably in motive power and allied equipment.

They must be willing to work hard, accept increasing responsibility.

As Farr Company continues to grow, these men will grow with us. Those who are interested—and can qualify—are invited to send complete resumés to:

G. F. Thruelsen, General Sales Manager, Farr Company—P.O. Box 90187, Airport Station—Los Angeles 45, Calif.

DEADLINE

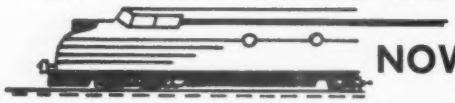
DECEMBER 31, 1959

NO LATER THAN THIS,

CAB VENTILATORS

Patent Applied For

MUST BE INSTALLED IN ONE-THIRD OF ALL DIESEL LOCOMOTIVES



NOW IN SERVICE. IT IS TO YOUR ADVANTAGE FOR THESE CAB VENTILATORS TO BE REASONABLY PRICED $, AND EASILY INSTALLED. THIS NEW TPC MODEL 86040 IX, 3 POSITION VENTILATOR IS A ONE UNIT CONSTRUCTION, AND DOES NOT HAVE SLEEVES, OR OTHER COSTLY INSTALLATION FEATURES. THIS UNIT WILL FIT ANY CAB CONTOUR WITH

NO INSIDE PROTRUSIONS.

INFORMATION ON REQUEST

TRANSPORT PRODUCTS CORPORATION

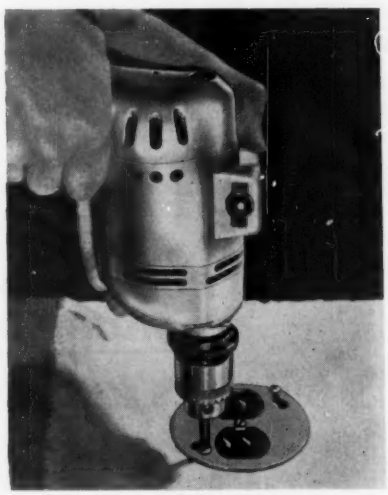
3008 MAGAZINE ST. • LOUISVILLE, KY.

What's New

(Continued from page 14)

withstand the abrasive action of dry chemical and fertilizers.

Until three years ago, the North American Car Corp. had limited success with paints or plastic, but fertilizers like muriate of potash would scratch the coating and corrosion would begin. The coatings failed in as little as six months. Thiopox was then sprayed on car interior and exterior. After three years' service carrying muriate of potash, the coating was inspected and reported to be in excellent condition. One hundred additional cars now coated with polysulfide epoxy are expected to be in service for at least five years without need of additional coating or painting, providing ten times the life of previous coatings and reducing maintenance time. *Thiokol Chemical Corp., Dept. RLC, 630 Fifth ave., New York.*



Double-Purpose Drill

The Scru-Drill combines the properties of a drill and power screwdriver in a single, hand-held unit. As a drill, the tool can be used with twist drills up to ⅜ in., wood augers to ¾ in., and hole saws from ⅝ to 1¾ in. A turn of the spindle collar converts it to an equivalent of the Scrugun, with a screwdriving clutch. As in the Scrugun, the bit idles for finding the screwhead slot, then forward pressure of the tool engages the mechanism and drives the screw The Scru-Drill also can be used for running up nuts by using shanks and sockets A reversing switch permits quick removal of screws or nuts in disassembly operations. *Black & Decker Mfg. Co., Dept. RLC, Towson 4, Md.*

Liquid Oxygen Manifold

Liquid oxygen cylinders can now be manifolded with the Oxweld M-40 which, when used with four Linde LC-3 liquid oxygen cylinders, provides an uninterrupted supply

of 12,000 cu ft of oxygen. The manifold features an automatic changeover from one bank to another. As the supply in one cylinder bank is depleted, it automatically continues to supply oxygen from the other bank. Standard models of the manifold are supplied for use with four or two Linde LC-3 cylinders arranged in two banks. *Linde Co., Division of Union Carbide Corp., Dept. RLC, Room 2840, 420 Lexington ave., New York 17.*

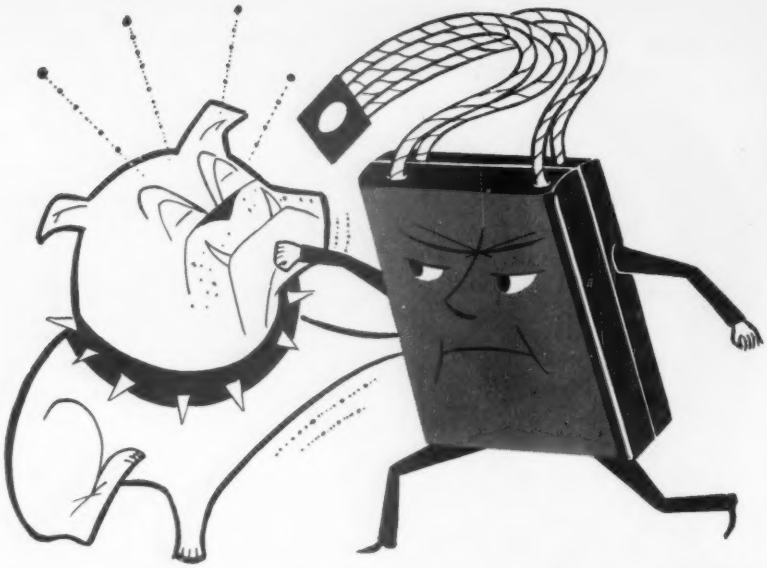
Sand Nozzle

A flexible sand nozzle that extends the sand pipe almost to where wheel contacts rail is made of Lo-Temperature neoprene. When the sanding valve is opened, any frozen or wet sand causes the pressure within the system to build up. This increased pressure causes the nozzle to spread open and expel the material. *Electrical Products Division, Joy Manufacturing Co., Dept. RA, 1201 Macklind ave., St. Louis 10, Mo.*

Gas-Cutting Machine

An oxygen-cutting machine, the Linagraph, has been designed for cutting irregular shapes. It operates on the pantograph principle. All the heavy duty bearings are totally enclosed and have sealed lubrication to insure trouble-free pantograph performance. Cutting machines of this size utilize the tractive effort of a small wheel driven around the template, guided manually or electronically. The Linagraph uses 110 a-c and is capable of making four simultaneous cuts in steel plates up to 8 ft wide, of any length, and up to 12 in. thick. The pantograph-mounted cutting heads and the tracing table are mounted on the same rails to conserve space and obtain maximum rigid-

SPECIFY
STRATOFLEX
"275"
FLEXIBLE HOSE ASSEMBLIES
for maximum air brake dependability!
Stratoflex "275" wire braid hose, with SF 426 and 435 reusable fittings, meets standard applications for railroad air brake lines. Hose is made from seamless synthetic rubber innertube, reinforced with one fabric braid and one high tensil steel braid in sizes -10 and -12. Sizes -16 and -24 are reinforced with two steel wire braids. Write for detailed information.
Left—High pressure surge testing hose assemblies at Stratoflex plant.
STRATOFLEX Inc.
P.O. Box 10398 • Fort Worth, Texas
Branch Plants: Los Angeles, Fort Wayne, Toronto
In Canada: Stratoflex of Canada, Inc.
SALES OFFICES: Atlanta, Chicago, Cleveland, Detroit, Fort Wayne, Fort Worth, Houston, Kansas City, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Seattle, Toronto, Tulsa



THE DIESEL BRUSH THAT WALLOPED TOWSER

Sounds impossible, but this is the way the legend explains it:

An otherwise perfectly behaved Stackpole brush was once seen strolling through the park. Suddenly, without warning, it went up to the toughest, meanest-looking bull dog in sight, walloped him soundly on the snout and sent him running.

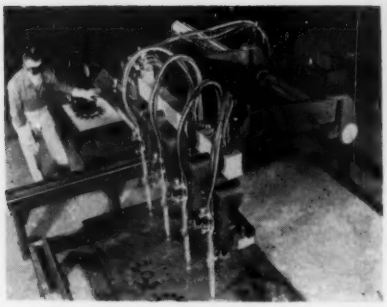
When later asked about this unseemly behavior, the brush explained: "It's because all my life I'm expected to be so goody-goody to commutators. I'm not allowed to burn 'em or even rough 'em up just a little. Once in a while, I've just got to prove I'm not a total sissy. That's why I walloped Towser."

Naturally, the erring brush was promptly reprimanded for this unseemly behavior on the part of a Stackpole product. Meanwhile, and whether or not any subsequent Stackpole Brushes have felt impelled to pick fights with dogs, you can count on it they are always nice as pie to commutators. And because of this, they save lots of railroads lots of money when commutator reconditioning time rolls around.

STACKPOLE CARBON COMPANY · St. Marys, Pa.

STACKPOLE
diesel-electric
BRUSHES

Brushes for all rotating electrical equipment • Electrical contacts • Rail-bonding molds
Seal rings • Welding & Brazing tips • Graphite bearings • Voltage regulator discs
Anodes for electrochemical cells • Heating elements & Electrodes • Rocket nozzles
Friction segments • Dozens of Electrical & electronic components . . . and many more.



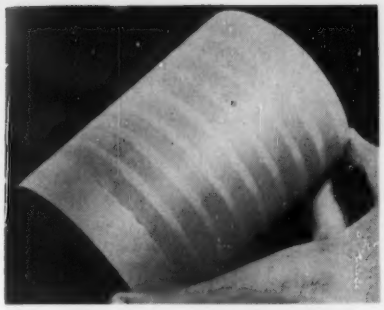
ity. The tracing table is movable, providing flexibility in nesting parts in order to reduce scrap without moving the templates. The table is easily locked in place, and all key controls are readily accessible. *Air Reduction Sales Co., a division of Air Reduction Co., Dept. RLC, 150 E. 42nd st., New York 17.*

Oil Condition Indicator

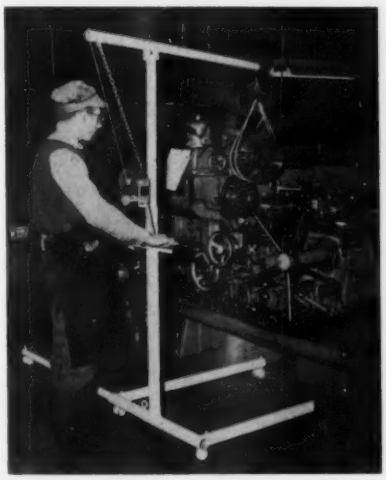
The Model DG oil condition indicating meter is a gage type. It serves gas, gasoline and diesel engines and, because it is not affected by variations in crankcase temperature, responds to changes in the oil due to contamination by dilution, water, running on dead filters, etc. The meter is easily read whether the engine is running or stopped, because the meter pointer remains on reading position. *Gerin Corp., Dept. RLC, Avon, N.J.*

Hard Facing Alloy

Ring grooves in aluminum pistons are one of the areas of engines being improved by the use of precision welded zones of superhardness and high-wear resistance on aluminum castings. According to Alcoa re-



search engineers, one of four new aluminum welding alloys now under test provides a Brinell hardness of 250 at room temperature, which is as hard as heat-resistant high-alloy steel. Aluminum pistons generally exhibit 110 Brinell hardness. At 500 deg F, the new welding alloys provide areas four times as hard as aluminum piston compositions at the same temperature. *Aluminum Co. of America, Dept. RLC, Room 783, Alcoa Bldg., Pittsburgh 19.*



Hand Crane

The WC54A Junior crane has been designed for safe positioning of loads up to 300 lb. It is powered by a small hand winch having a mechanical ratio of 30-1 and only 10 lb of force is needed to operate the lever handle. Telescoping masts give a lifting height of 9 ft 6 in. Sidebars on the mast enable smooth transport and turning of the entire crane. With the crane, a single man can lift an engine head or radiator assembly and replace it without strain. *Thern Machine Co., Dept. RLC, 3760 W. Fourth st., Winona, Minn.*

Manually Operated Fastener

The Model 115 fastener is a manually operated tool capable of developing a pulling force of 6,000 lb. With the exception of the Conical Keystone lock blind rivet, it installs all Huck fasteners from 5/32 to 3/8 in. nominal diameter both in steel and

HEAVY DUTY PUNCH
Fast, versatile punch punches 34 patterns without tool change. 2½" hole through 1½" steel or a number of smaller round or shaped holes. Handles 65 ft. stock.
GAP TYPE PRESS
For forming, bending, flanging, pressing. 250-ton capacity.
QUILLOTINE BAR SHEAR
For production or short run shearing of rounds, squares, angles and bars without changing tools. 43 to 300 ton capacities.
VERTICAL BULLDOZER
For hot and cold pressing and forming of heavy metal. Can also be used as press brake. 400-ton capacity.
HORIZONTAL BULLDOZER
200-ton press features rapid production and return speeds for heavy forming, flanging, bending.

Tool Up With BEATTY *For Efficient Low Cost Metal Working*

Savings in metal working start with Beatty machines . . . job-engineered equipment that is especially designed to speed work flow and provide dependable, accurate performance — on the production line or on short run jobs or repair work. Beatty machines are built rugged and rigid to give more low-cost, maintenance-free production per man-hour; earn more profits per square foot of floor space and dollar investment.

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aluminum. Continued rotation of a low-friction ball screw mechanism installs any fastener in a single stroke. The tool weighs 5¼ lb. *Huck Manufacturing Co., Dept. RLC, 2480 Bellevue ave., Detroit 7.*

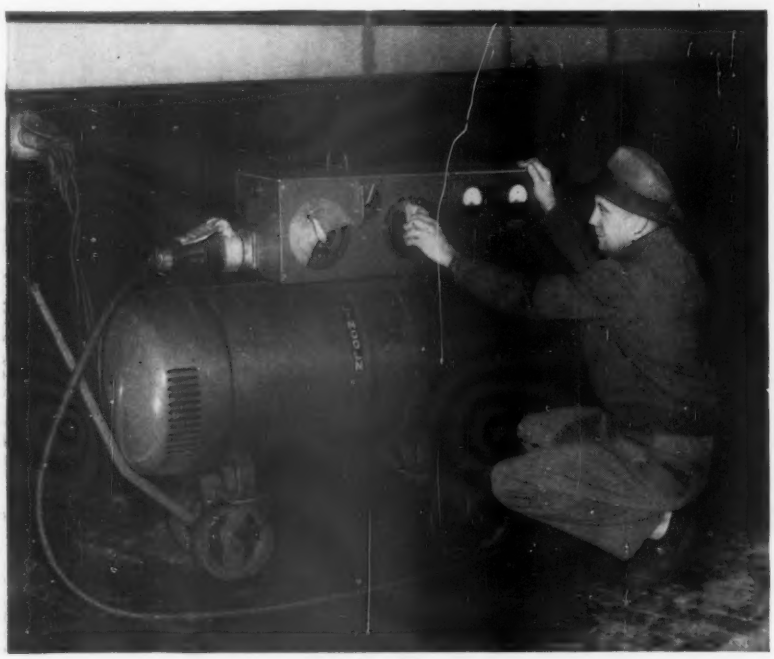
Airless Spray-Painting Equipment

The airless method of spray painting forces material through a small orifice (.011 to .018 in. inner dimension) at pressures of from 1,800 to 2,400 psi. It is said to have specific advantages for applications such as the spray painting of heavy machinery, interior structures and other surfaces where exhaust facilities for the removal of vapors and overspray are limited or non-existent. On exterior painting, "airless atomization" permits rapid coverage with wide spray patterns without creating excessive mist and rebound. Masking and shielding on most "rough" work can be eliminated. The equipment is portable and can handle heavy or light bodied material. *DeVilbiss Co., Dept. RLC, Toledo, Ohio.*

Electric Hydraulic Press

The 150-ton electric hydraulic press, for use in rolling mills and railroad repair shops is engineered to handle heavy duty jobs requiring pressures up to 150 tons. Model MPH-150-E22 is equipped with a 2-hp motor and has a ram speed at no

(Continued on page 65)



THE LINCOLN RAILROADER DOES DOUBLE-DUTY

IT'S A WELDER
Heavy-duty industrial machine with dual, continuous controls . . . a production-type welder, designed for rugged work. Will handle any job in the shop.

IT'S A BATTERY CHARGER
Earns its keep when not welding, by charging both lead-acid and Edison-type batteries.

Three sizes cover entire range of welding capacity and industrial batteries usually used by railroads.

Write or call for further information.

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THE LINCOLN ELECTRIC COMPANY
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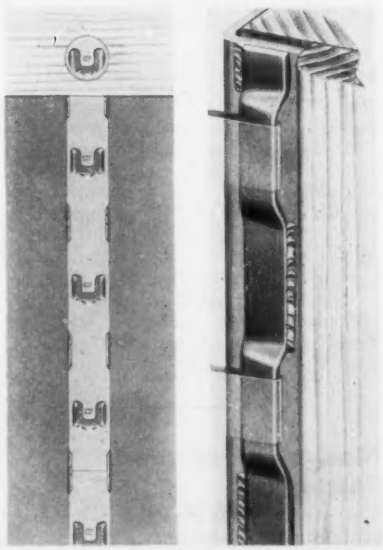
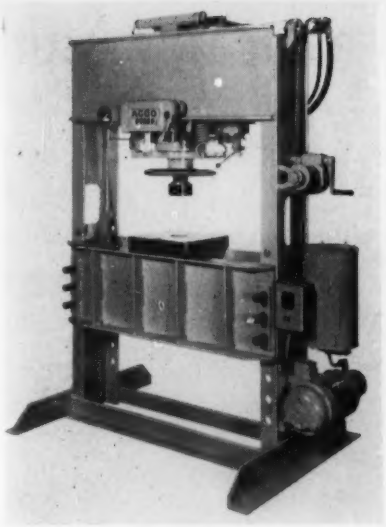
The world's leading manufacturer of arc welders, electrodes, AC motors and battery chargers.



Lading strap anchors developed by the Mac-Lean-Fogg Lock Nut Co. The illustration at the left was upside down as shown on page 14 of the September issue.



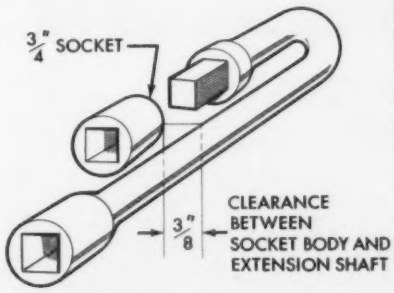
load of 4.2 in. per min and 2 in. per min at full load. Model MPH-150-E55 is equipped with a 5-hp motor and has a ram speed at no load of 11 in. per min and 7.5 in. at full load. Approximate weight of the 2-hp. press is 3,000 lb; of the 5-hp press, 3,200 lb. The "power package" for the press is rated at 25 per cent duty cycle for the 150-ton capacity and at 50 per cent duty cycle for 110-ton capacity. *ACCO Equipment Div., American Chain & Cable Co., Dept., RLC, 929 Connecticut ave., Bridgeport 2, Conn.*

Letters

Wrench for EMD Basket

TO THE EDITOR:

I would like to bring to your attention an economical way to make a wrench for the trunnion-type rod bolted basket used on EMD engines.



The bolts on the bottom of the basket have a ¾-in. head, and the clearance is such that a socket is the only type of wrench that will fit. In using a socket, it requires a man on each side of the engine to tighten these bolts. With the wrench shown, one man can tighten them very handily.

The wrench is made of a ½-in. drive extension, 10 in. long, and is bent to the shape of a "J." This will hold a socket and, because of the bend, it will back itself up without holding it by hand.

Art Graham

Electro-Magnetic Switchgear

TO THE EDITOR:

I was a bit confused by the diagram of power circuits of the EMD Electro-Magnetic Switch Gear shown on page 92 of the September issue. It shows two power contactors labeled *P1*. Am wondering if the one in upper left of diagram should have been marked P2 instead of P1? There is also a contactor standing open position in the vertical line between motors 1 and 3 which is not numbered at all. What is its identification?

Gordon Taylor

TO THE EDITOR:

The comments of Mr. Taylor to the effect that "he is confused" are nothing compared to the embarrassment experienced at this end. Mr. Taylor is correct regarding the designation of the *P* contractors. The one not labeled is *S13*.

L. L. Johnson
Electro-Motive Division

In its new $300,000 production-line paint installation, the Bangor-Aroostook Railroad now uses Spee-Flo Hot Spray Equipment to apply the synthetic enamel finishes used on the road's colorful fleet of 4,677 revenue cars. This finish is accomplished with hot spray in a single coat, 2 mils thick and at an average time savings of one-third over the old method.

Controlled hot spray gives uniform viscosity, regardless of weather, and results in a better finish with substantial savings in time and materials . . . improved quality and extended film longevity.

Let us arrange an on-the-job demonstration and you be the judge. Write for informative booklet "Why Hot Spray?"

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154

America's foremost engineered lettering tools

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RAILWAY LOCOMOTIVES AND CARS

published monthly at Newark 2, New Jersey for November, 1959.

1. The names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Robert G. Lewis, 30 Church St., New York 7, N. Y.
Editor C. L. Combes, 30 Church St., New York 7, N. Y.
Managing editor, F. N. Houser, 30 Church St., New York 7.

2. The owners are: Simmons-Boardman Publishing Corp., 30 Church St., New York 7, N. Y. Stockholders of one per cent or more, James G. and Louise Lyne, 30 Church St., New York 7, N. Y., Arthur J. McGinnis, 30 Church St., New York 7, N. Y. Frederick A. and Artimese B. Clark, 20 Ellis Drive, Basking Ridge, N. J., Joseph or Katherine Sanders, 2909 Maple Ave., Dallas 4, Texas, John R. Thompson and Kathe Thompson, 79 West Monroe St., Chicago 3, Ill., Ruth Wheaton Johnson, 1615 Ravenna Blvd., Seattle 5, Wash., Mrs. E. S. Fenton, c/o Russell & Russell, 41 East 42nd St., New York 17, N. Y., J. Streicher & Co., 2 Rector St., New York, N. Y., Partners of J. Streicher & Co. are: Joseph Streicher, Jack L. Streicher, Ethel Streicher, Judson Streicher, all of 2 Rector St., New York, N. Y., Morton & Co., c/o Marine Midland Trust Co., 120 Broadway, New York 15, N. Y.

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ROBERT G. LEWIS
Signature of publisher

Sworn to and subscribed before me this 28th day of September, 1959.

AGNES L. ASHTON

[SEAL]

(My commission expires March 30, 1961)

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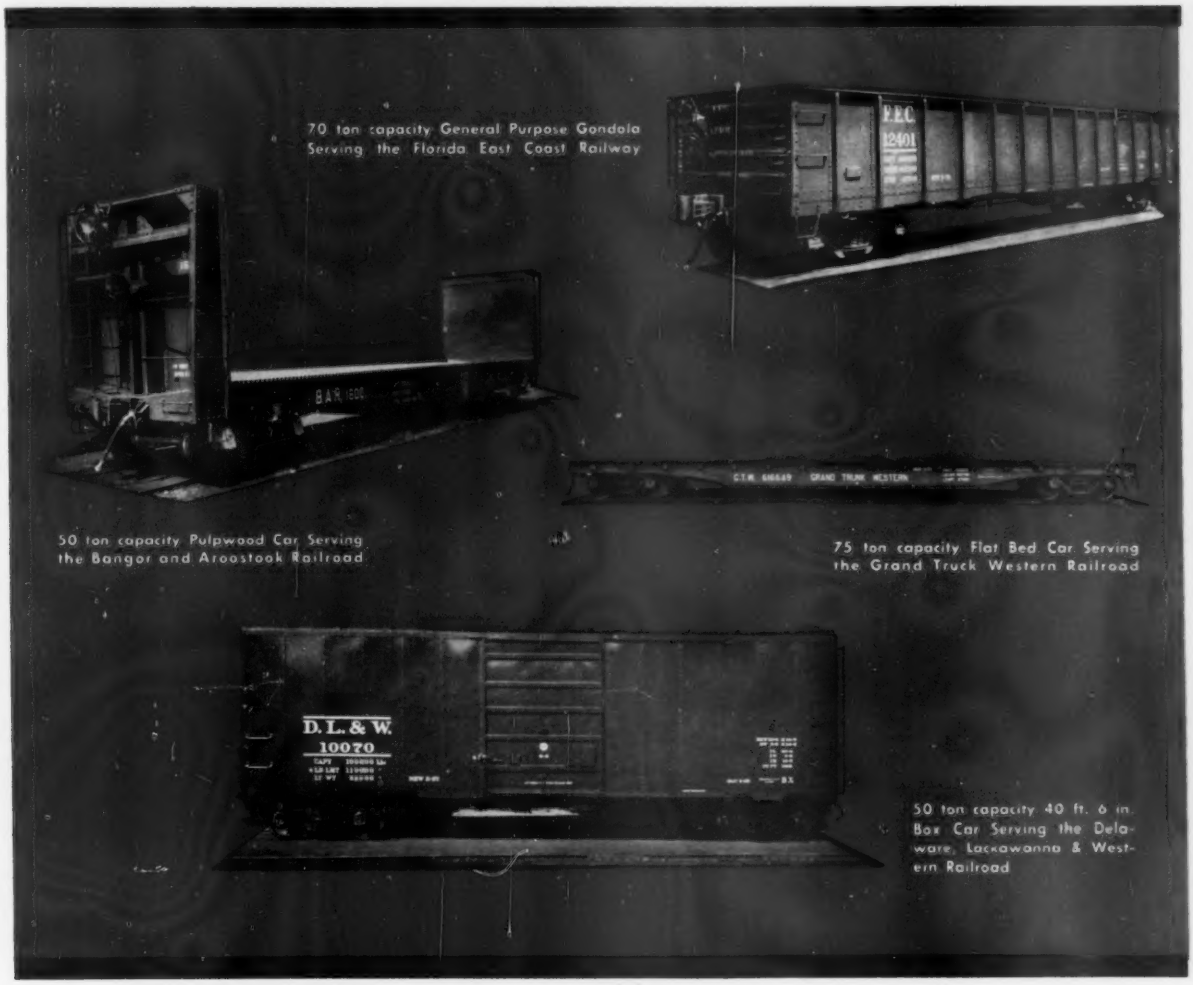
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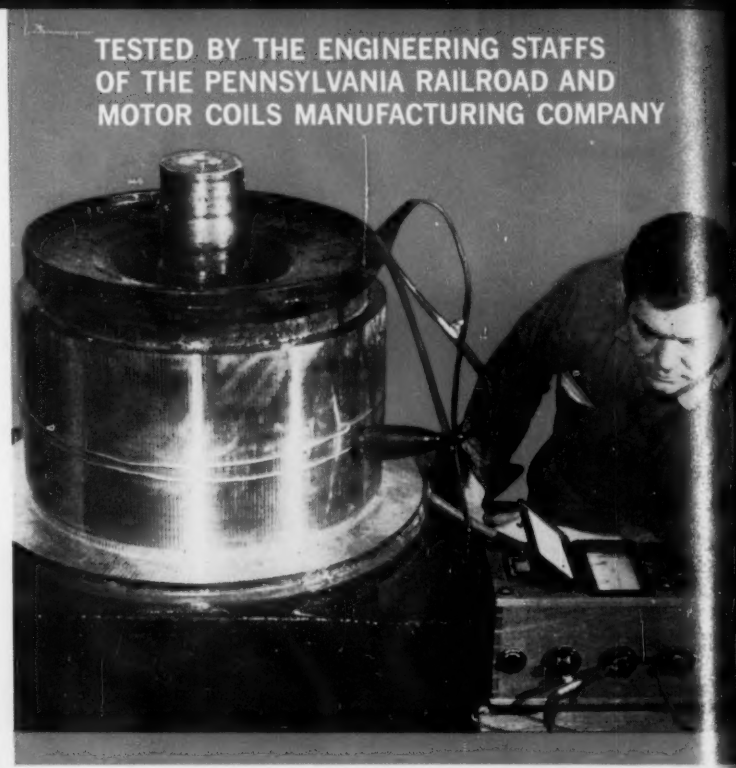

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